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A

VOYAGE OF DISCOVERY,

MADE UNDER THE ORDERS OF THE ADMIRALTY,

IN

HIS MAJESTY'S SHIPS

ISABELLA AND ALEXANDER,

FOR THE PURPOSE OF

EXPLORING BAFFIN'S BAY,

AND ENQUIRING INTO THE PROBABILITY

OF A

North-West Passage.

By JOHN ROSS, K. S. Captain Royal Navy.

SECOND EDITION.

IN TWO VOLUMES.

VOL. II.

LONDON:
Printed by Strahan and Spottiswoode, Printers-Street;
FOR LONGMAN, HURST, REES, ORME, AND BROWN,
PATERNOSTER-ROW.
1819.

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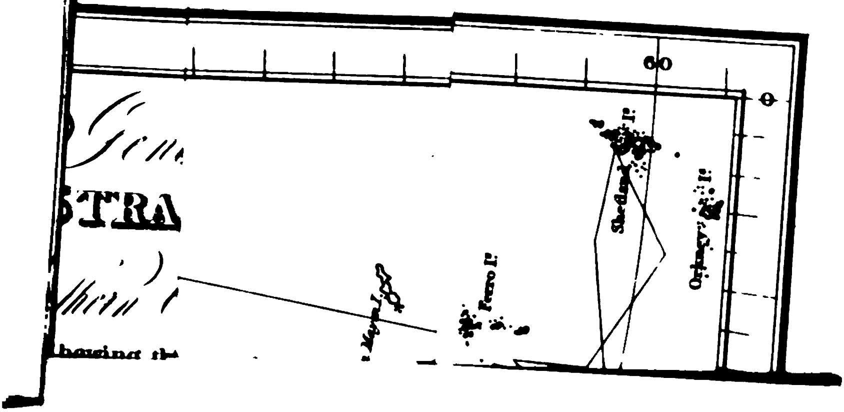
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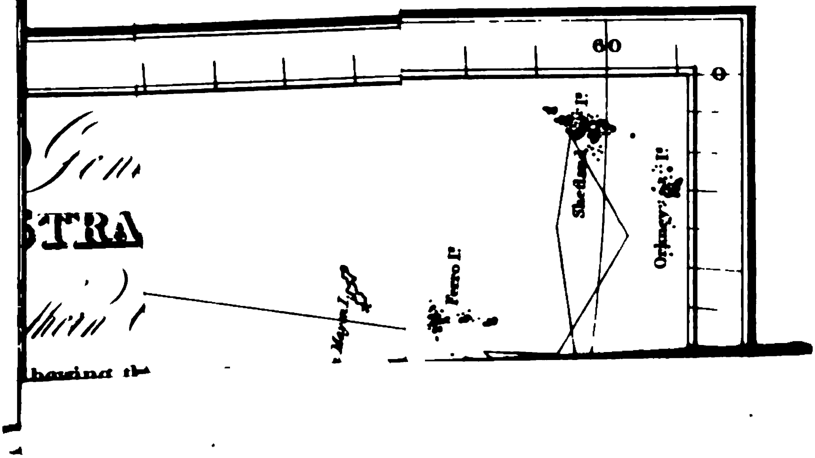
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VOYAGE OF DISCOVERY

TO

THE ARCTIC REGIONS.

CHAPTER XI.

CONTINUE OUR PROGRESS TO THE SOUTHWARD, EXPLORING THE WEST COAST OF BUFFIN'S BAY — CAPE GRAHAM MOORE — POND'S BAY — COUTTS' INLET — NORTH GALLOWAY AND NORTH AYR DISCOVERED — LAND ON AN ISLAND NEAR CAPE EGLINGTON, WHICH IS NAMED AGNES' MONUMENT — CONTINUE EXPLORING THE COAST AND REACH CAPE WALSINGHAM.

Sept. 1. Lat. 72° 37¼' N. Long. 74° 13¾' W. Var. 110° W.

We continued to make a S.E. by S. course, in which direction I had seen the southern extremity of the land before the fog came on. This however had now completely cleared away, and at day-light we found ourselves about six leagues from Cape Bathurst. At four we hauled in to take a better view of the coast, and came within a few miles of a high cape, which was named after Sir Graham Moore. To the southward of this we opened a wide inlet, which had, at first, the appearance of a strait, but it was soon discovered to be occupied by a large glacier, which extended for a considerable distance into the sea, and at the bottom of the inlet, the land was seen to be continuous. To this I gave the name of Pond's Bay, in compliment to the Astronomer Royal. To the southward of this we passed two capes, which were named Cape Bowen and Cape Macculloch; we were abreast of the latter at noon, and found it to be, by its bearings, in latitude 72° 13′ N., and longitude 74° 17′ W.; a small bay between them was filled with ice. We continued to run down the coast until we were abreast of a very remarkable inlet, when we were becalmed. To this bay, which was also discovered to be surrounded by land, and occupied by ice, I gave the name of Coutts' Inlet. The northern Cape by which it was bounded, received the same name, and that of Antrobus was given to the southern one. The mountains in the interior were more completely covered with snow than those about Cape Cobourg; but the declivities near the coast were clear of snow, as were also some low projecting points of land.

At sun-set, the land was distinctly seen as far as to the S.E. point, forming a continuation of the same chain of mountains which has been described in the last Chapter, and extending to the distance of thirty leagues; the line of coast gradually taking a more easterly direction. Several very large icebergs, which had no doubt been generated under some of the precipices on this part of the coast, were here floating about in every direction. During this day we had run down above seventy miles of the coast, and I was completely satisfied that there could be no passage any where between lat. 73° 33' and 72°. As we had run a great distance from the Alexander, we hove to, that she might have an opportunity of joining us, and in the mean time we sounded in one hundred and twenty fathoms, and found sandy mud. On the Alexander coming up with us, we learnt that the observations made on board the two ships agreed, and that neither of us had observed any part of this coast to be inhabited. Two whales were seen off the entrance of Coutts' Inlet, but no birds, except our constant attendants the Fulmar peterels. In the evening the wind fell, and we pursued our course under an easy sail.

Sept. 6.—Very soon after midnight it became calm, and after day-light there were some light and variable airs of wind. At eight it again fell calm, and continued so the whole day. The ship's head had, however, been generally kept near the course, by the assistance of the swell, which was from the north; and we made fourteen miles of southing and a degree of easting, although the log only gave half as much. We obtained some good observations in the forenoon for the longitude; and the sun being visible in the meridian, we also took its altitude for the purpose of ascertaining our latitude, but the afternoon was cloudy. At six, it being quite calm, and the water smooth, we sounded with the deep sea clamms, and found one thousand and fifty fathoms, which were the deepest soundings we ever reached in Baffin's Bay. As we had only one hundred and twenty fathoms fifteen miles further north, it is evident that the bottom of the sea, like the land, must here be very mountainous. The mud at the bottom was so soft, that the instrument was completely buried, and it required considerable force to draw it out. The sea being a dead calm, the line became perfectly perpendicular, and we had a good opportunity of obtaining the exact depth before it started out of the ground. The instrument came up completely full, containing about six pounds of mud, mixed with a few stones and some sand. This mud was much coarser than that which we had before obtained, and was also of a much looser nature; when the line came up, a small star-fish was found attached to it, below the point marking eight hundred fathoms. The instrument took twenty-seven minutes to descend the whole distance. When at five hundred fathoms, it descended at the rate of one fathom per second, and when nearly one thousand fathoms down, it required one second and a half per fathom. Although the check made to the motion of the line when it struck the bottom, was evident to all, I wished to put the fact beyond doubt; and for this purpose, it was so nicely set as to act on the least resistance. The self-registering thermometer was then attached to it, and it was let down, first to five hundred fathoms, and afterwards to six hundred, seven hundred, eight hundred, and a thousand, in succession. At each time it came up empty, the thermometer each time showing a lower temperature; thus proving that the water was colder as it became deeper, and also indicating that the instrument had not reached the bottom, even at the depth of one thousand and five fathoms. It occupied one hour for all hands to pull it up from that depth. Land was distinctly seen this evening, bearing S.E., and a yellow sky appeared two points further to the eastward. To the land abreast of us, which had never been seen by former navigators, I gave the name of North Galloway, and to the bays and capes, various names which will be found in the chart. This land was very high, and of the same description and appearance as that which we passed yesterday. Every creek was completely filled with ice, and there was no reason to doubt that the land was continuous. There were no appearances of its being inhabited, no current was found, nor could any tide be perceived.

Sept. 7.—During the night the swell subsided, and the calm continued until seven this morning, when a shower of snow brought with it a breeze which lasted an hour and a half. This wind was variable, but we were able to continue our course along the land, which took a south-east direction. We sounded with a heavy lead, of one hundred pounds weight, and found one thousand and fifteen fathoms. It reached the bottom in twenty-one minutes, and was hauled up in forty-eight. The lead, which was observed distinctly to strike the bottom, appeared, when it came up, to have been, like the clamms, sunk more than its own depth in the mud. After this experiment, the clamms were sent down, with a self-registering thermometer attached, to one thousand and five fathoms, and the temperature of the sea at that depth was ascertained to be twenty-eight and a half: the instrument, coming up without any thing in it, proved that it had not been at the bottom. The furthest land distinctly seen to be continuous with that abreast of us, was named Cape Adair, its latitude being 70° 24′ N., and longitude 70′ W. This part of the coast, which is also very high, forms a curve, and within it were seen two small islands. To one of these I gave the name of Bell Isle, and to the other Marianne Isle. A great number of icebergs and glaciers were here seen, and every inlet was filled with them. Immediately after we had finished our experiments, a breeze

Sept. 7. Lat. 72° 16½′ N. Long. 70° 46½′ W. Var. 90° W.

sprung up from the S.E., and we stood in shore under all sail, continuing to beat along it at the distance of from four to six leagues. On tacking, the deviation was observed to be four points, that is, nearly two points on each side; being the same as that before observed; for the wind being S.S.W., the ship lay on one tack W.N.W., and on the other E.S.E.; the wind *appearing* on the former tack to be S.W., and upon the latter to be south.

At four P.M., the breeze freshened very considerably, and the weather became thick, in consequence of which the rigging was soon covered with ice. At six, the royal masts were struck, and at eight the top-gallant yards were sent down and the top-sails double reefed. It was evident that the ships did not hold their own, and that it was necessary to get a better offing, especially as the wind had shifted more to the eastward. Towards midnight, the swell from the S.E. had got up considerably, and the ships made a great deal of drift, owing to the want of gripe and forefoot. The wind was now south by compass, and, in consequence of the deviation, the ships appeared on one tack to lie east, and on the other west. Having got an offing of seven leagues, we stood off and on, so as to keep about that distance, until the weather moderated and cleared.

Sept. 8.—It became moderate this morning, and we again began to get to the S.E., but it continued thick till noon, when it cleared sufficiently to allow of a tolerable observation being obtained. We then altered our course, so as to close the land, and made all sail. At sun-set we saw the coast between Cargenholm and Hamilton's Bay; and having then out-run the Alexander seven miles, we shortened sail till she should join us, which she did about 7^h^ 30^m^. I received Lieutenant Parry's reports, and found that her deviation had been, in one instance, five points: for this he did not assign any reason, but as I learned that some iron casks, which had previously been secured on the quarter-deck, had been removed, it is probable that this was the cause of the difference. The rest of his reports were very satisfactory; his observations by the chronometers, his latitudes, and his meteorological journal, agreeing with ours. Our stock of vegetables being expended, orders were given that a certain proportion of preserved meat and soup should be served out to the crew, in lieu of a part of the salt provision, in order to prevent scurvy.

Sept. 9.—During the night the wind had shifted to the north, and our course was shaped for Cape Adair, which had been seen last night; but the day continuing snowy and thick, it was necessary to give that point a good birth. We, therefore, ran on a parallel with it until it was certain that we had passed it about three leagues, when we hauled our wind direct for the shore, taking the usual precautions of sounding and looking out. We saw several streams of ice, and, at four P.M., the land was discovered, appearing, at first, like a chain of islands; but they afterwards proved to be part of the main land, and to form the

N.E. point of this coast. This land bore S.W., and Cape Adair was seen soon after bearing N.W. The land between them shortly appeared, and when discovered to be continuous, we bore up for the Cape which was first seen, which I named Cape Eglinton; the bay to the northward of it was called Scott's Bay. Having arrived within six miles of Cape Eglinton, we sounded in forty-nine fathoms, and discovered that the land trended towards the south. As this country was also a new discovery, I named it North Ayr; a low point, which was supposed to be an island, to the north of the Cape, was called Horse Island, from its resemblance to the island of that name off Ardrossan; and a bay, which had the appearance of a good anchorage, was called Ardrossan Bay, from that harbour on the coast of Ayrshire. I was desirous of putting into this bay, for the purpose of making observations, and accordingly stood off and on, at the distance of four miles, having from thirty-eight to one hundred fathoms, until day-light; but unfortunately the ships had drifted so far to leeward, having been obliged several times to bear up in order to avoid the ice, that in the morning we could not fetch within three miles of the point. This part of the coast assumed a different character from that to the north; the mountains being more detached, of a rounder shape at the tops, and less covered with snow; but in the interior they were equally high, and had a similar appearance.

Sept. 10.—The weather appearing fine, we bore up along the land, at the distance of three miles, and rounded a low point, from which a reef appeared to extend about a league into the sea. This point was bare of snow, and the mountains behind it appeared to have been only recently covered. A small island was discovered to the southward, and a boat was sent with a party to take possession of it in the usual form. They found some difficulty in landing, but at last effected it on the south side; and having examined it, they set up a flag-staff, left a bottle with an account of their proceedings, and returned. They found that this island had been recently inhabited; the remains of a temporary habitation, a fire-place, a broken stone vessel, a part of a human skull, some bones of a seal, some wood partly burnt, and a part of a sledge, were brought on board. The tracks of dogs were also seen, and some stones were found set up in a particular manner.

This island, which was named Agnes' Monument, is nearly circular, is about forty feet above the level of the sea, and is flat at the top, being rather highest towards the N.W.; it is bold all round, except at a short distance from the N.W. and S.E. sides. The tide near it was observed, at ten o'clock, when it was high water, to be setting to the southward, at about one mile in the hour. It lay in the mouth of a deep inlet, into which I determined to proceed for the purpose of anchoring and making observations; but at four P. M. a dangerous reef was discovered stretching across the entrance, and I was obliged to haul off. When the boat was absent, two large bears swam off to the ships, which were at the distance of six miles from the land; they fetched the Alexander, and were immediately attacked by the boats of that ship, and killed; one, which was shot through the head, unfortunately sunk; the other, on being wounded, attacked the boats, and shewed considerable play, but was at length secured, and towed to the Isabella by the boats of both ships. In this affair, Mr. Bisson, Mr. Nius, midshipmen, and Mr. Fisher, assistant-surgeon of the Alexander, shewed much dexterity and address. This animal, which is fully described in the Appendix, weighed one thousand one hundred and thirty-one pounds and a half, besides the blood it had lost, which cannot be estimated at less than thirty pounds. Its dimensions were carefully taken, and Mr. Beverly undertook to preserve the skin, in which he perfectly succeeded; the bones of the head and feet were also preserved in their places, so that he was sent to the British Museum in excellent order. In the evening we stood to the eastward, to get out of the influence of the tide, which

Sept. 11. Lat 70° 34½′ N. Long. 76° 46¼′ W. Var. 75° 00′ W.

changed about six, and set to the northward at the rate of one mile an hour. This inlet is bounded by high mountains, those only in the interior being covered with snow; it appears to be the mouth of a small river, and was named Clyde River; the island to the north being named Haig's Island, and that to the south Bute Island. The icebergs which were seen this day had much the appearance of low islands, and they were surrounded with loose ice; the whole appearing to have lately been separated from the land. Some large whales were seen in the morning *running** towards the south.

Sept. 11.—The wind was against us, but the weather being moderate during the night, we carried all sail, standing off until two A.M., and afterwards in shore. At day-light we saw the land, and the weather was very clear; we plainly distinguished the coast to the north of Cape Adair, at the distance of twenty leagues, and recognised it to be the same we had seen on the 5th instant. The land, bearing S. by E., was also seen at the same distance; and, about S. by W., a very remarkable mountain, resembling a pyramid of great height, appeared, detached from the rest which formed a continuous ridge. We found the whole of this part of the coast to be lower near the sea than it had been to the northward; the chain of mountains, which had formerly approached the sea coast, now retiring into the interior at the apparent distance of fifteen or twenty miles. Between these mountains deep valleys were seen, which were probably the channels of the small rivers that fall into the bays and inlets every where to be found on this coast.

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* A term used when whales are swimming with great velocity in a particular direction.

At eight o'clock this morning we were seven leagues to the eastward of the rock, or island, that had been named Agnes' Monument; and two miles to the eastward of us we discovered the largest iceberg we had ever seen at such a distance from the land. As it was nearly calm, I thought it a good opportunity to obtain its size by actual measurement. For this purpose I sent Lieutenant Parry, Mr. Ross, and Mr. Bushman, and a party was also sent with the necessary instruments, to obtain the magnetic dip and variation; while we stood towards it with a very light air. Considerable difficulty was experienced in the attempt to land, as in rowing round it they found it perpendicular in every place but one: in this however there was a small creek, in which a convenient landing-place was discovered. When they had ascended to the top, which was perfectly flat, they discovered a white bear, who was in quiet possession of this mass. As their fire-arms had been wetted, it was some time before dispositions could be made for an attack, during which the animal seemed to wait with patience for the assault; but as soon as they had formed their line and began to advance, he made for the other side of the island. Our party had not calculated on any other way to escape but the landing-place before mentioned, which they had left well guarded; but to their mortification, as well as astonishment, when the animal came to the edge of the precipice, which was fifty feet high, he plunged into the sea without hesitation, and there being no boat on that side of the island, he escaped. The party remained until sun-set, and had good observations; and Lieutenant Parry reported to me, that the iceberg was four thousand one hundred and sixty-nine yards long, three thousand eight hundred and sixty-nine yards broad, and fifty-one feet high; being aground in sixty-one fathoms. Its appearance was much like that of the back of the Isle of Wight, and the cliffs exactly resembled the chalk cliffs to the west of Dover. In the evening the breeze which had sprung up from the southward freshened, and as soon as the boats returned, we passed under the lee of the iceberg, and stood off shore. We found our observations on board to agree with those made on the berg, and found the latitude pretty exactly by Cole's method, and, again, soon after dark, by the pole star. Lieutenant Parry here reported another change on the Alexander's deviation.

Sept. 12.—The weather being clear, and the wind in such a direction that no progress towards the south could be made, I resolved to stand across to the eastward, in order to determine if there was any land or not between the west and east sides of this part of Davis' Strait. All sail was accordingly made, and we stood to the eastward. At day-light it was blowing fresh, and we were obliged to reef the topsails and strike the royal-masts. At ten it became thick, and the Alexander being eight or nine miles astern, we shortened sail. We saw a great deal of loose ice, and passed through a stream of it; many large icebergs were also seen. At ten it became thick, and the ropes were covered with ice: while we had, during the whole day, a heavy fall of snow. At four P.M., we were about mid-channel, when a bottle and a copper cylinder, each containing an account of our proceedings, were thrown overboard. While we hove to for the Alexander, I sounded in two hundred and ninety fathoms, and found a hard bottom: no current was perceived; if there had been any, we must have observed it, as we passed several icebergs which lay aground. As we knew we should not be able to fetch that part of the west coast which we had left, we continued our course to the eastward; and, in the evening, the wind moderated, but the weather was still very thick.

Sept. 13.—We stood on until day-light, when the wind shifting to the S.E. it became necessary to tack. We were at that moment one hundred and twenty miles to the eastward of the coast we had left; the weather became clear, and we could certainly see ten leagues in that direction. It was therefore fully ascertained, that no land existed in the channel of Davis' Strait, about the latitude of 70° 40′; as our track from the opposite shore nearly met the one from this side. There is, consequently, no such land as James's Island, which is laid down in most of the charts. We now stood back to the westward; and, in passing some loose ice, we saw a bear on one piece, which we ascertained to be one hundred miles from the land. We had good observations both for the latitude and longitude.

Sept. 14.—During this night, which was extremely dark and thick, the utmost caution was necessary to keep clear of the ice. We had our top-sails close-reefed, and the main-sail furled, with the royal masts and yards struck, the sea running very high. The Alexander fell much astern, and to leeward, probably in consequence of her being obliged frequently to bear up on account of the ice. She was not in sight at day-light; we therefore wore, and bore up to look for her, and, at five, discovered her to leeward. As soon as we joined her all sail was made, but the wind fell considerably, and soon after came to the N.E. At noon, we had a good meridian altitude; we also sounded, and found five hundred and seventy fathoms in soft greenish mud; we had no observations for the longitude, but by the reckoning we were sixty miles to the eastward of the land we had left. The wind then increased, and we ran a-head of the Alexander, and, towards evening, made the land. The weather then becoming thick, we hove to for her, and, after she joined, ran on till eight; when, by the reckoning, we were in latitude 70°, and thirty-six miles eastward of the land which we had seen on the 11th. We then hauled our wind to the eastward under the topsails, it being too thick to run. During the whole of this day we had much swell from the S.W., which, however, abated considerably towards the evening. We also saw many icebergs and some loose ice.

Sept. 15.—We maintained our position during the night, and the weather in the morning, though still cloudy and hazy, was more favourable for closing the land than it was on the preceding day; while the wind, being from the north, with a commanding breeze, was very advantageous, as it admitted of our hauling off on the appearance of danger. The swell continued, but its direction was rather more from the eastward. At seven, A.M., we discovered a cluster of islands, which we afterwards found to be five in number, and we also ascertained, that they were two leagues distant from the main land. We supposed them to be the Salmon Islands, as they agreed in latitude with the islands of that name which are found in some charts. We passed these at the distance of three leagues, and ran along the land, which was low near the shore: the names of several capes and bays which we explored sufficiently to determine the continuity of the coast, will be found in the chart. The mountains were not so high, nor so much covered with snow, as those forty miles to the northward; and they were also at the distance of several leagues from the sea. A low point was seen about noon, bearing S. by W.; and, from the end of it, a reef of icebergs which appeared to be aground, denoted shoal water. This was found to be a bank, having no more than eighteen fathoms water on it, extending to the eastward as far as could be discerned from the mast-head; and we found the tide running across it to the southward, at the rate of two miles and a half an hour. This shoal, which I named Isabella Bank, must prevent the possibility of ships passing to the northward along this coast, until late in the season; the icebergs, which are aground on it, stopping the floes which drift down from the north, and preventing them from being carried to sea by the wind and tide, so as to keep this part of the strait a long time impassable. Near the north edge of this bank we found the water deep, and came suddenly into a rippling of the tide, in which we had at first thirty-five and then twenty fathoms. The water now became smooth, and I was obliged to carry more sail than I could have wished, in order to avoid any risk of the ship being carried foul of the icebergs between which we were obliged to pass. The anchors were prepared, the lead kept going, and the ship's company stationed to act as might be necessary. For three miles, we had from twenty-four to nineteen fathoms; and were, when on the centre of it, at the distance of eight miles from the point before mentioned, which I now named Cape Kater. The quality of the soundings was very various; we had, successively, fine and coarse, grey and red sand and mud; on the shoalest part we had stones, and on the edges coral and shells. The south edge appeared to be equally steep with the north, as from twenty-four fathoms we fell suddenly into fifty, after which no bottom was found in one hundred fathoms: in two hours afterwards we hove to, and sounded in four hundred and seventy fathoms, finding soft mud. To the south of this we discovered a spacious bay, in which was an island, to which I gave the name of Wollaston Island; it was surrounded with ice. We ran along the coast until near dark, when we hove to for the Alexander, which was at a considerable distance astern. At eight, we hauled to the east, and stood off and on, it being too dark to run, or to examine the coast. We observed that the tide changed at four o'clock, and then ran to the southward; and, by the icebergs, the water seemed to have [illegible] [illegible] [illegible]. [illegible] [illegible] being one [illegible] [illegible] [illegible] [illegible]. [illegible] [illegible] ten, we [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] which, we were [illegible] [illegible] [illegible] [illegible] [illegible] this carried [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] into the influence of [illegible] [illegible] [illegible] [illegible] have wished; [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]. At midnight we [illegible] [illegible] [illegible] [illegible] [illegible] cloudy weather.

Sept. [illegible]—[illegible] [illegible] [illegible] [illegible]. [illegible] [illegible] been carried [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] southward; [illegible] [illegible] [illegible] [illegible] [illegible] we made [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] discovered [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] of three [illegible] [illegible] [illegible] [illegible] [illegible] and [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] ourselves [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] which, however, [illegible] [illegible] [illegible] [illegible] [illegible] that a [illegible] [illegible] [illegible] [illegible] [illegible] ble, [illegible] [illegible] [illegible] [illegible] the [illegible]. We [illegible] [illegible] [illegible] [illegible] forced [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] reached the [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] that, [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] penetrate, [illegible] [illegible] [illegible] [illegible] [illegible] far to the eastward, made it necessary to haul our wind immediately, in order to extricate ourselves. Although the greatest care was taken in cunning the ship through the innumerable masses of ice which surrounded us, yet a press of sail being absolutely necessary, we unavoidably received many severe shocks, but met with no material damage. The tide, which had been setting us rapidly to the southward, changed at half-past ten, and had the effect of opening the ice considerably, as well as of setting us to windward. We appeared to gain ground by the icebergs which were near us, which we found were all aground on the edge of a shoal; on this we sounded in thirty-five fathoms, but had no doubt that the water was much shallower further to the southward, as we observed field-ice fixed on it, and extending to the southward as far as could be distinguished from the mast-head; at the same time the eastern extremity of this field was discovered at the distance of twelve miles from us, and round it we had to beat. We named this shoal Alexander's Bank, and the headlands within it, already mentioned, were named after the officers of that ship.

At three o'clock, when it was near the top of high water, we weathered the field-ice and bore up in order to force a passage through a stream which appeared to run between it and a large floe to the eastward. We soon after passed very near to a large iceberg, on which were a large bird, of the falcon kind, and a bear; the former immediately flew away, but the latter, after looking at us for some time, climbed to the top, apparently with the intention of jumping into the sea, but, finding it was too high, he descended, and when at a short distance from the lower edge, plunged into the sea; several shots were fired at him, but the distance was too great for the balls to take effect, so that he escaped.

At five o'clock we chose the place that appeared most easy to force in this stream of ice, and our passage was effected in about an hour, when we again found ourselves in the open sea. We ran along the edge of the land ice until sun-set, when we shortened sail for the night. During the whole of this day, the Alexander was managed with much skill and ability: she carried sail and kept up with the Isabella to admiration, and it must be attributed to the exertions of her commander and officers, that she was not compelled to pass the night among the broken ice, which, from the heavy swell which we found there, could not fail to have been attended with serious consequences. We had a good opportunity of making observations on the tides, which confirmed those we had made yesterday. We had no meridian altitude of the sun, but by Mr. Cole's method, we found ourselves at three o'clock to be in latitude 65° N.; we had clear weather at sea, but the land was obscured by fog in the evening.

Sept. 17.—The night was clear, and we had several observations for latitude by the polar and other stars, and I also obtained good lunar distances between the moon and Aldebaran, by which the longitude was determined. At day-break we steered for

Sept. 17. Lat. 68° 07½' N. Long. 63° 00' W. Var. 70° W.

the land, and saw that which yesterday bore south, now bearing due west, having closed it to a sufficient distance for determining its continuity. We bore up, and, running along it, discovered that it took an easterly direction; several names were given to the different head-lands and bays which we passed, none of which were free of ice, or had the least appearance of a passage. We also discovered a promontory bearing S.E. of us, which I named Cape Broughton; this seemed to terminate the land, but in the evening the yellow sky was seen, and another Cape, which was named Cape Searle, was discovered; the bay between them is called Merchant's Bay, and was full of ice. The chain of mountains, which was still uninterrupted, seemed now to rise from the sea, its direction being north and south; the last named Cape being, however, a few miles to the eastward. At the distance of eight leagues from the land, we found one hundred and eighty fathoms water; several icebergs, but no loose ice, remained on this part of the coast. At sun-set we reefed the topsails and hauled our wind for the night, having, as usual, joined the Alexander.

Sept. 18.—The night proving fine, and the sky clear, we had excellent observations for the latitude and longitude. I found the lunar observations to agree exactly with the means of the five box chronometers. At two A.M., we tacked and stood for the land, which, at day-light, was seen extending from N.W. to S.S.E., and quite clear of fog; the mountains were very high and irregular. A very remarkable rock, resembling a castle, or tower, here forms the point of a large bay, or inlet; we had no doubt that this was Dyer's Cape, and that the inlet to the south was Exeter Bay, discovered by the celebrated navigator Davis. We obtained this day good observations for latitude, and distances of the sun and moon for the longitude. We also explored the coast as far as latitude 66° 50′, when a Cape, which we supposed to be the Cape Walsingham of Davis, was seen to the southward. At sun-set we hove to, as usual, to sound, and to give the Alexander an opportunity of joining; and found bottom at the great depth of one thousand and seventy fathoms, obtaining a quantity of very soft mud of a rusty colour. When the Alexander came up, I made the signal for Lieutenant Parry to return sealed orders, and delivered him other orders instead of them, to be opened in case of parting company: his observations and reports were found to agree with ours, except in the bearings of the land; the difference being, doubtless, occasioned by the uncertainty of the deviation of the magnetic needle in that ship. The wind, during this day, was light and variable; towards night it settled to the northward; the weather also becoming cloudy, so that no observations could be obtained.

During the whole of the progress related in this chapter, a bottle, or a copper cylinder, containing an account of our proceedings, was thrown over-board every day, as soon as the ship's position had been determined.

CHAPTER XII.

PROCEEDINGS OFF CAPE WALSINGHAM AND MOUNT RALEIGH — EXPERIMENTS ON THE TEMPERATURE OF THE WATER — THE BREADTH OF DAVIS' STRAIT, AND NON-EXISTENCE OF JAMES'S ISLAND DETERMINED — PROGRESS TO THE SOUTHWARD — SANDERSON'S TOWER — SEVERAL ISLANDS DISCOVERED — ARRIVE OFF CUMBERLAND STRAIT — DEPARTURE TAKEN FROM RESOLUTION ISLAND — ATTEMPT TO MAKE CAPE FAREWELL — A DREADFUL STORM — ARRIVE AT SHETLAND.

Sept. 19.—Cape Walsingham was this morning seen to the S.W., at the distance of ten leagues; we stood towards the land with a light breeze, and discovered a high mountain, which we took to be Mount Raleigh of Davis; but the tops of the mountains, this day, were generally obscured with fog, and the sun was only seen when near the meridian. Some birds were observed, which were, at first, supposed to be of a new species, and a boat was sent to procure specimens; but they turned out to be the little awk changing its colour, the feathers on the back being partly grey; specimens of them were preserved. In the afternoon it fell quite calm, when we sounded in six hundred and sixty-eight fathoms. I thought this a good opportunity to try the temperature of different depths by means of the self-registering thermometer, and it was found to be as follows: at six hundred and sixty fathoms, 25½°; at four hundred, 28°; at two hundred, 29°; at one hundred, 30°. The bottom was mud of a yellowish rusty colour, and very soft. The tide, whether from our incresed distance from the land, or the state of the moon's age, was considerably diminished in strength; and, when tried, its velocity was found to be scarce half a mile an hour. In the evening the wind sprung up from the southward, and we stood off shore; being unable to make any progress against it.

Sept. 20.—The night continued moderate, but cloudy, and the aurora-borealis could sometimes be faintly distinguished.

The wind being against us we still stood off shore, but towards morning it shifted a little in our favour, and we again stood for the land, gaining thereby a few miles southing. At noon the Cape was seen to the S.W., at ten leagues' distance. The sea was much smoother than it had been for some days; and the breeze being steady, I determined to stand off shore for the night, because it was the best tack for gaining ground upon, and because it gave us a chance of making the east side of Davis' Strait without losing time. Nothing remarkable took place, and our observations tended to confirm those of yesterday. After dark the breeze freshened, and the swell increased proportionably.

Sept. 21.—Towards morning the weather became clear and fine, the sea was smooth, and we had a series of good observations; *viz.* for the latitude, by the polar star and meridian altitude of the moon; for the longitude, by the distances of the moon from Pollux; and, for time, by the altitude of Capella. The different observers agreed within a few seconds of each other; and the means of all the observations agreed with the chronometers.

At eleven, we had the further satisfaction of making the land which we had seen on the 7th of June, near Queen Anne's Cape, on the east coast of Davis' Strait, which completely proved that our longitude was correct. At noon we sounded in forty fathoms; a few miles further off shore than where we had, on the 7th of June, sounded in thirty-five fathoms; we then tacked and stood to the westward. By this, and by our stretch across from Cape Eglinton, it was fully determined that James's Island did not exist; and that the land, which has been mistaken for it, is Cumberland of Davis, on which we found Cape Walsingham and Mount Raleigh, exactly in the latitude in which that navigator placed them; differing only in longitude, like all other places in this part of the world. In the evening the breeze, which had gradually increased, reduced us to close-reefed topsails. The royal masts and top-gallant yards were struck, and the crow's-nest was taken from the mast-head. We stood to the westward, but the gale was driving us up the Strait; and the Alexander, which could not carry sail, got far to leeward, so that we were obliged to bear up and join her occasionally. Many large icebergs were in sight, and it is worthy of remark, that the highest end of these masses was generally to windward; we had indeed before observed, that they turned in this direction almost immediately as the wind changed. No observations were made this evening.

Sept. 22.—The gale continued the whole day, but neither barometer nor sympeisometer foretold it, nor did either of them fall after it came on. We supposed ourselves about noon to be three-fourths across the Strait towards the west, when we wore, and took up a situation for the purpose of waiting a change; we drove directly up the Strait, and had also to bear up occasionally for the Alexander, which was very leewardly.

Sept. 23.—The weather continued very

unfavourable the whole of this morning, but the wind and sea were considerably diminished after a very heavy fall of snow, which lasted until three P.M.; when it was succeeded by a very thick fog, but in half an hour afterwards it became suddenly clear. The land, the sun, and the moon, were seen at the same moment, and good observations were made. In the evening the latitude was found by the altitude of the polar star; and it is, perhaps, worthy of remark, that we observed the meridian altitude of the moon *below the pole*, exactly on the arctic circle, which we crossed at 44 minutes past seven P.M. The wind having afterwards shifted to the north, we had a few hours good weather, and at 4^h 15^m we had the best observations. Mount Raleigh bore west, at the distance of eighteen leagues. This mountain, which is the easternmost on this side of Davis' Strait, is of a pyramidal form, and exceedingly high; our observation makes it in latitude 66° 37' north, and in longitude 61° 14' west. Cape Walsingham being in latitude 66° N. and longitude 60°

50' W., is the easternmost land; and the breadth of Davis' Strait, at its narrowest part, is consequently about one hundred and sixty miles. Towards evening we sounded and found two hundred and ninety fathoms with soft mud, and a substance like hair in it; we had a light air from the southward, and stood off and-on.

Sept. 24.—The sky became obscured, and the wind began to increase about one o'clock, until it brought us under single-reefed topsails; we then stood to the eastward or westward, tacking occasionally to take advantage of the wind, which varied sometimes one or two points. The weather was cloudy until near noon, when it cleared, and we had a good meridian altitude, together with observations for the chronometers about two P.M.; after which it again became cloudy. We then stood to the westward in hopes of making the land; but in this we were disappointed, and as it shortly became foggy we stood to the southward.

Sept. 25.—The wind had gradually mo-

Sept. 25. Lat. 66° 04′ N. Long. 59° 24′ W. ☉ – ☾ 59° 30′ W.

derated during the night, and we made some progress: at eight in the morning we saw the same iceberg seven miles to leeward of us, near which we had passed at eight the preceding evening. We again had good lunar distances, which proved that the means of the five-box chronometers gave the true longitude, and I determined accordingly to correct the rates of each at the end of the month. Towards noon we fell in with a small iceberg, and as it became calm soon after, we had an opportunity of procuring as much ice as filled two tanks; the Alexander also received the same quantity. A very thick fog coming on, obliged us to give up this pursuit.

The winter being now at hand, and the seamen in want of warm clothing, the slops which were supplied by Government for this purpose were served to the ships' companies, orders being sent to Lieutenant Parry to that effect. The whole of this day the weather was so foggy that the land was completely obscured.

Sept. 26.—The fog cleared away about

noon on this day, and we saw the berg from which we had procured ice, six miles to the northward of us. At one, a breeze sprung up, and we hauled in for the land, which we discovered at four o'clock, bearing from N.W. to S.W.; the nearest land being at nine leagues distance. The coast here seemed to take a south-westwardly direction; the top of Mount Raleigh was distinctly seen like an island at the northern extremity, about eighteen leagues off; and from Cape Walsingham to the south there was a number of small bays and capes, the names of which are given in the Chart; but the continuity of land was perfectly ascertained as far as latitude 65° 30′ N. We sounded in three hundred and seventy fathoms, off the pitch of Cape Walsingham; the weather was very clear, and the aurora-borealis * was seen until near midnight, when it again became foggy.

Sept. 27.—We had some difficulty this morning in getting sight of the Alexander, which was necessary before altering the course; we steered S.W. which was nearly in the direction of the southernmost point we saw, and fired guns occasionally to denote our position to her. At one P.M. we saw the land bearing from N. to W.S.W.; the intermediate land formed a semicircular bay, and, as far as latitude 65°, was found to be continuous from the northernmost land, which was part of that which we had seen last night, as, the wind being light, we had made but little progress. In the afternoon, having a light air from the N.E. we again stood to the S.W., but it fell calm in two hours after; we had observations for latitude during the night by the polar and other stars; after divine service the ship's company were mustered and their clothes inspected.

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* The reports on the aurora-borealis will be seen in the Appendix.

Sept. 28.—At midnight we [illegible]ing run as far south as the [illegible] had been explored; at daylight it was still calm, [illegible] we made sail for the land [illegible] covered at seven [illegible], [illegible] this coast and [illegible] 64° 30′, and at noon [illegible] [illegible]dred and fifty-[illegible] [illegible] it fell quite calm, and remained so the remainder of these twenty-four hours.

Sept. 29.—A light air having sprung up from the westward we stood towards the southward, but the wind soon afterwards backed to the south, and we immediately tacked and stood to the westward; we had numerous good observations both before and after noon. At four P.M. we were within four leagues of the land, in latitude 65° N.; to the north we saw the land which had been discovered yesterday, and had a more perfect view of it. The Cape which we were off last night, which was named Cape Mickleham, seemed joined to the main by a narrow neck of land; to the N.E. of it appeared a bay with three small islands: one was round and flat, and two were conical in shape: within them there appeared to be the entrance of a small river. To the southward of the above-mentioned Cape the land was no less remarkable; near the southern extremity a high conical mountain was seen bearing W.S.W., and a mountain which resembled a martello tower, [illegible] was S[illegible] evening [illegible] appearance of a [illegible] southward, [illegible] reefed topsails.

Sept. [illegible]—[illegible] so hard as to oblige [illegible] and take in the [illegible] towards day-light [illegible] three the gale had [illegible] was discovered. [illegible] westward, all [illegible] close this land, [illegible] was setting us to the N.E. [illegible] we passed a number of very large icebergs, which we found were aground on a bank, and on which we sounded in eighty fathoms: on each side of this we had one hundred and ten, and at a short distance no bottom in one hundred and fifty. The direction of this bank was N.E. by N.; it seemed to be about six miles in length, but was only one quarter of a mile broad. The tide set over it at noon on this day, N.E. by E., at the rate of one mile and a half per hour. We tried for fish on this bank, but found none. At four P.M. the land was very distinctly seen, bearing from N.N.E. to W. by S. The high mountain which was seen yesterday, bearing W.S.W. now bore W.N.W.; and a head land, having the appearance of a cape, bore, at sun-set, W. by S. The latitude by the pole-star was determined to be 63° 40′ N. When this cape bore west, its longitude by the chronometers, and by the altitude of Arcturus, was found to be 65° west: it was named Cape Enderby: some small islands, which were seen to the southward, were named Swedish Islands, and the southernmost of them, Charles's Island.

The land here trended to the westward, appearing to form an inlet, and on the opposite side of it land was also seen, bearing south. After dark the course was altered to south; it was blowing fresh, and, having run ten leagues, which brought us off the last land we had distinctly seen, we hauled to the wind, on the larboard tack, under close-reefed topsails. At [illegible] cloudy weather and [illegible] found, by our reckoning [illegible] had set us twenty-five [illegible] during the last twenty-four [illegible]

Oct. 1.—We [illegible] light, when we [illegible] at seven we made [illegible] ed to be at the [illegible] from the land [illegible] ward of it. [illegible] clear, the land we [illegible] tinctly seen, [illegible] same time the [illegible] latitude answered [illegible] Foreland: [illegible] westward of [illegible] north, there was [illegible] doubt but that [illegible] As we approached [illegible] we found a strong [illegible] day, set round [illegible] direction. Several [illegible] seen to the [illegible] entrance, which [illegible] thirty and forty miles wide. The land was also seen bearing S ½ W. In the morning the tide was observed to carry the ship to the westward, and, after noon, to the S.E., at the rate of two miles an hour. As the first of October was the latest period, which, by my Instructions, I was allowed to continue on this service, I was not authorized to proceed up this strait to explore it, which, perhaps, at the advanced season of the year, might be too hazardous an attempt; the nights being now long, the little day-light we had being generally obscured by fogs or snow, and the rigging of the ship covered with ice. I thought it, however, advisable, to finish our operations for this season, by making Resolution Island, the exact situation of which had been laid down by Mr. Wales; I, therefore, determined on steering for the southernmost land in sight; we consequently crossed the entrance of Cumberland Strait, and, making an allowance for indraft, steered about S.S.E. It will appear that, in tracing the land from Cape Walsingham, no doubt could be entertained of its continuity until the place where we found Cumberland Strait, which is much further south than it was laid down from the latest authorities which the Admiralty were in possession of; but it is very near the place where Davis placed it in his chart, which has been found since our return. From the circumstance of a current being found at the entrance of this Strait, there is doubtless a much better chance of a passage here than in any other place; and it was a subject of much regret to us, that we had not been able to reach it sooner.

Oct. 2.—Having run a sufficient distance to bring us abreast of the land we saw last night, we hove to at one o'clock, with the ship's head to the northward; and, at four, we wore and hove to with the ship's head to the southward, the wind being from the westward. At day-light we made sail for the land, and made Resolution Island at nine o'clock: it bore about S.W., distance eighteen leagues. Before noon it fell calm, and became foggy. We sounded in six hundred and fifty fathoms, and obtained from the bottom several small shells and stones: we discovered that the tide, at different periods, set in various directions, but strongest to the S.E. and N.W. At eight o'clock a light breeze sprung up from the westward; we then ran fifteen miles to the southward, and hove to.

Oct. 3.—It was my intention to have taken a better view of Resolution Island, in order to prove the accuracy of our longitude; but the weather being foggy, and the wind light and variable, I was obliged to abandon the attempt as too hazardous under the circumstances of thick weather, bad-sailing ships, a dark moon, spring-tides, and a coast surrounded with rocks. The time I was directed to leave the service on which I was employed was also arrived; but our bearings of yesterday were sufficient to convince us, that our observations and chronometers could not be materially wrong. During the last night, which was both dark and foggy, the Alexander had separated from us considerably, and the wind being light she did not join us until noon. We then bore up for Cape Farewell, having intimated, by signal, that it was my intention to make that Cape on our passage home; we sounded in three hundred and seventy fathoms, Cape Best on Resolution Island bearing west, distance sixteen leagues, by our reckoning: in the evening a light breeze sprung up from the westward and we pursued our course.

Oct. 4.—We had good observations for the latitude, longitude, and variation, and found the latter considerably decreased; we sounded at noon, but found no ground in nine hundred and fifty fathoms; at the same time the self-registering thermometer was sent down, and the temperature of the sea at that depth, was found to be 35¼°, while at the surface it was at 41°, that of the air being at 37°. Before sun-set I altered the course to S. by E., in order to get sooner into the parallel of Cape Farewell. During the night we had snow, and fresh breezes from the W.N.W. On the morning of the 6th it blew a gale, which brought

Oct. 8. Lat. 59° 00¾′ N. Long. 51° 23½′ W. Var. 46° 00′ W.

us under the close reefs; the sea rose so suddenly, that before the dead lights in the cabin could be secured, two of the windows were broken to pieces; at four o'clock the wind shifted to the northward, and gradually decreased. We continued our course during the seventh and eighth, and on the latter morning about eight we were on the same spot on which we had been at on the 27th of May, when outward bound. About noon the bowsprit was discovered to be sprung, and, the wind increasing, no time was lost in getting in the flying jib-room: we also sent down the fore-top gallant mast and yard, to ease the bowsprit, and the runner and tackles were fixed as a temporary security for the fore-mast; we supposed that this damage was the effect of the late gale. The day was employed in fishing the bowsprit with two spare oak tillers, which, being crooked, saved the necessity of taking out the chock between the knight-heads. This expedient was effectual, but the work was not completely finished before night. On the morning of the 9th we had a heavy gale; the top-gallant yards and masts were sent down, but we were enabled to continue our course until half-past eleven, when we were obliged to take in the fore and main-top sails, and to scud under the foresail. At noon we were eighteen miles south of Cape Farewell, as laid down by Captain *Upton* *; but the weather was so tempestuous that we could not see above four or five miles, on account of the foam and drift on the sea. About 1h 30m the sea running very high, the Alexander was observed to broach to, and being unable to scud any longer, she continued to lie to; our bowsprit being not sufficiently secured, I was under the necessity of keeping before the wind as long as possible, but before sun-set a double belly-stay was fitted and set up, and the fishes of the bowsprit secured. About six o'clock one of the quarter boats was carried away, although it had been turned bottom up, and hoisted as high as possible for security; and, soon after, the dog I had purchased at Prince Regent's Bay was also unfortunately washed overboard. About eight o'clock the foresail gave way, and the ship could no longer be steered; we then brought to under the trysail. Soon after this the starboard quarter boat was washed away; during the night, much water was also shipped, and the boarding of the bulwark was washed away by the sea, which sometimes made a breach over the ship, but no other damage was sustained. Fortunately me met with no ice, but in the morning several large icebergs were seen.

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* Cape Farewell is in lat. 59° 45′ N., and long. 47° 56′ by Capt. Upton.

At four, A.M., on the 10th, the gale began to abate, and, at noon, we were able to carry the close-reefed topsails, which were immediately set. The Alexander not being in sight, we steered to the northward, being the most probable direction for finding her.

On the 12th, the weather being fine, and calm, we sounded, but had no ground in one thousand fathoms. We sounded again, on the 14th, with no better success.

Nothing remarkable happened on our passage to Shetland, during which we had generally moderate weather, with frequent snows and fogs. One iceberg was also seen on the 17th, about midway between Cape Farewell and Shetland. On the 25th of October we made the Islands of Ferroe; and, on the 26th, were close to Saddeloe, where we found our chronometers to agree with its longitude. We had afterwards thick weather, and could only discern the tops of the mountains.

On the 30th of October we made the island of Fula, and, passing between Fair Isle and Sumburg Head, arrived at Shetland, anchoring in Brassa Sound, after an absence of exactly six months. We here found the Alexander, she having anchored only a few hours before, and all well. The Lerwick packet being about to sail for Leith, I sent a short account of our proceedings to the Secretary of the Admiralty, for the information of their Lordships: in which, after recommending the officers and men of both ships, for their meritorious con-

duct, I concluded in the following words:—
"Not an instance of punishment has taken "place in this ship, nor has there been an "officer, or man, in the sick list; and it is "with a feeling not to be expressed, that I "conclude this letter, by reporting that "the service has been performed, and that "the expedition, which I had the honour "to command, has returned, without the "loss of a man.

"I have, &c.

"J. Ross."

CHAPTER XIII.

PROCEEDINGS OF THE SHIPS AT SHETLAND — SAIL FROM THENCE, AND ARRIVE AT HULL — GENERAL ORDERS TO THE OFFICERS, AND VARIOUS REGULATIONS — ARRIVAL IN THE THAMES — AND CONCLUSION OF THE VOYAGE.

We had no sooner anchored in Brassa Sound, than our friend, Mr. Mouat, came on board, to welcome our return, and to offer us accommodation in his house: we were thereby afforded an opportunity of concluding our scientific operations. The dipping needle was accordingly landed, and observations were made, by which it was proved that no alteration had taken place in that valuable instrument. Altitudes of the sun for time were taken by the artificial horizon: and the meridian altitudes for latitude were also observed, both on board and on shore. The longitude by the chronometers was also found, for the purpose of determining, by the known longitude of Shetland, the errors of the watches. The variation of the compass was also accurately observed, and the results of all these operations will be found in the Appendix. I also made experiments on board both ships, to determine the points of change, and the amount of the deviation in this harbour, for the purpose of comparison with those made in Baffin's Bay; and these observations, which are at full length in Appendix No. I., will be found of much importance.

In the mean time our water was replenished, our cables and anchors arranged, our crews refreshed, and every preparation made for our voyage to the Thames; and the wind coming fair, we sailed from Brassa Sound on the morning of the 7th of November, having previously sent a sealed letter to Lieutenant Parry, with directions to open it in latitude 58° North. The purport of this letter was, according to the tenor of my Instructions, to require him, the officers, petty officers, or others, on board the Alexander, to seal up, and deliver to me, on the ship's arrival in England, all logs, journals, charts, and other memoranda, for the purpose of being delivered to the Admiralty, and held at their Lordships' disposal.*

We had a fair wind, which carried us off Flamborough Head, where we met with a strong breeze of N.E. wind; and, after beating for several days, we anchored in Grimsby Roads, on the 14th of November. The logs, journals, charts, and other memoranda, being sealed, and collected from all the officers of the expedition, I left the ship and departed for London, where I arrived on the 16th, and delivered them, with a full account of my own proceedings, to their Lordships.

Lieutenants Parry and Robertson pursuant to orders sailed from Hull on the 16th, and arrived at Deptford on the 21st of November. I was directed by Lord Melville to signify their Lordships' approbation of the conduct of the officers and crews of the two ships; and to acquaint them, that it was

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* Copy of the order is given in the General orders.

APPENDIX, No. I.

OFFICIAL INSTRUCTIONS.

By the Commissioners for executing the Office of Lord High Admiral of the United Kingdom of Great Britain *and* Ireland, *&c.*

" His Royal Highness the Prince Regent having signified his pleasure to Viscount Melville, that an attempt should be made to discover a Northern Passage, by sea, from the Atlantic to the Pacific Ocean; We have, in consequence thereof, caused four ships or vessels to be fitted out and appropriated for that purpose, two of which, the Isabella and the Alexander, are intended to proceed together by the north-westward through Davis' Strait; and two, the Dorothea and Trent, in a direction as due north as may be found practicable through the Spitzbergen seas.

" And whereas we have thought fit to intrust you with the command and direction of the former expedition, and have directed Lieutenant Parry, who has been appointed to command the Alexander, to follow your orders for his further proceedings; you are hereby required and directed to proceed to sea, with all convenient despatch, in the Isabella, and, taking under your orders the Alexander above mentioned, make the best of your way into Davis' Strait, through which you will endeavour to pass to the northward, without stopping on either of its coasts, unless you shall find it absolutely necessary. In this passage you may expect to meet with frequent obstructions from fields and islands of ice; to get clear of which, and to ensure the safety of the ships and people committed to your charge, will require from you, and all who are under your orders, the greatest precaution and vigilance. And, as the navigation among ice may be considered as an art to be acquired only by practice, we have directed that there be appointed to each of the ships under your orders, a master and a mate of whale-fishing vessels, well experienced in those seas, from whose knowledge and skill you may derive material assistance.

" It is not improbable that in the early part of the season, when you may be expected to arrive in Davis' Strait, the ice may be found to stretch across from land to land; but as ice is known to vary in its position from year to year, and several times in the course of a year, and, in those places where not fast by the ground, is almost constantly in motion by winds, tides, and currents; if, on your arrival, it should appear to present a compact barrier, you will, of course, be prepared to avail yourself of the first opening which may be discovered, to pass to the northward. As, however, in the present state of uncertainty with regard to the movements of the ice, and with the very imperfect knowledge we have of this strait, and still more so of the sea beyond it, no specific instructions can be given for your guidance, the time and manner of proceeding to fulfil the ulterior object of your destination, in places where impediments may occur, must be left entirely to your discretion; in the exercise of which we rely on your zeal and skill in your profession for the accomplishment, as far as it can be accomplished, of the service on which you are employed; not doubting that every exertion will be made on your part, and on that of your officers, while, at the same time, no precaution will be omitted, that prudence may dictate, to avoid accidents on an enterprise of so arduous a nature as that of conducting ships in safety through fields of ice in unknown seas. It may not, however, be amiss to suggest, as a general observation, that a passage through fields of ice is most likely to be found where the sea is deepest and least connected with land; as there is reason to suppose that ice is found to be more abundant near the shores of the continent and islands, in narrow straits, and deep bays. And it may also be expected, that the sea will be most clear of ice where the currents are strongest, as the stream of a river will continue open long after the sides are frozen up.

" From the best information we have been able to obtain, it would appear that a current of some force runs from the northward towards the upper part of Davis' Strait, during the summer season, and, perhaps, for some part of the winter also, bringing with it fields of ice in the spring, and ice-bergs in the summer.

" This current, if it be considerable, can scarcely be altogether supplied by streams from the land, or the melting of ice; there would, therefore, seem reason to suppose, that it may be derived from an open sea; in which case, Baffin's Bay cannot be bounded by land, as our charts generally represent it, but must communicate with the Arctic Ocean.

"In passing up the Strait, if such a current should be discovered, it will be of the greatest importance to you, in pointing out that part of the Strait which is likely to be the least encumbered with ice, as well as leading you direct to the opening by which it may be supposed to pass from the Arctic Sea into Davis' Strait.

"In tracing this current, you will soon discover whether it takes its origin in the north-east or north-west quarter: if in the former, you will, of course, abandon all pursuit of it further; but if it should come from the north-west or west, it will prove the best guide you can follow, to lead you to the discovery of which you are in search.

"The strength and direction of the current should be tried once in twenty-four hours; or oftener, if any material change is observed to take place; and it will be most advisable to take its temperature at the surface frequently, as you proceed, to compare it with the temperature of the surface, where there is no current.

"If the reports of several intelligent masters of whaling vessels may be relied on, that part of the sea to the northward of Davis' Strait, which is marked on the charts as 'Baffin's Bay,' (that is to say, from the 72d degree of northern latitude, to the 77th, where Baffin is supposed to have seen the land,) is generally free from field-ice, which, from its extent of surface, offers the greatest impediment to navigation. Should you find this actually to be the case, it may be advisable to stand well to the northward, before you edge away to the westward, in order to get a good offing, in rounding the north-east point of the continent of America; whose latitude has not been ascertained, but which, if a conjecture may be hazarded, from what is known from the northern coast of that continent, may perhaps be found in or about the 72d degree of latitude.

"In the event of your being able to succeed in rounding this point, and finding the sea open, you are carefully to avoid coming near the coast, where you would be most likely to be impeded by fixed or floating ice; but keeping well to the northward, and in deep water, make the best of your way to Behring's Strait, through which you are to endeavour to pass into the Pacific Ocean; and, in the event of your succeeding to pass this Strait, you are then to make the best of your way to Kamtschatka, if you think you can do so without risk of being shut up by the ice on that coast, for the purpose of delivering to the Russian Governor, duplicates of all the journals and other documents which the passage may have supplied, with a request, that they may be forwarded overland to St. Petersburgh, to be conveyed from thence to London; and from this, you will proceed to the Sandwich Islands, or New Albion, or such other place in the Pacific Ocean as you may think proper, to refit and refresh your crews; and if, during your stay at such place, a safe opportunity should occur of sending these papers to England, you should send duplicates by that conveyance.

" If the circumstances of your passage should be such as to encourage your attempting to return by the same course, you may winter at the Sandwich Islands, New Albion, or any other proper place; and early in next spring, may proceed direct for Behring's Strait, and use your endeavours to repass the same; and should you succeed in this attempt, you are to proceed, if possible, to the eastward, keeping in sight and approaching the coast of America, whenever the position of the ice will permit you so to do, in order that you may be enabled to ascertain the latitudes and longitudes of some of the most remarkable headlands or inlets that may occur; taking every possible precaution, however, against being beset by the ice, and thus compelled to winter on that coast.

" Before, however, you determine on returning by the same way, you will maturely consider and weigh the prudence of making such an attempt. If your original passage should be made with facility, and you see reason to believe that your success was not owing to circumstances merely accidental, or temporary, and that there is a probability that you may be able also to accomplish the passage back, it would be undoubtedly of great importance that you should endeavour to make it: but if, on the other hand, it shall have been attended with circumstances of danger or difficulty, so great as to persuade you that the attempt to return would risk the safety of the ships, and the lives of the crews, you, in this case, are to abandon all thoughts of returning by the northern passage, and are to make the best of your way home-ward, by Cape Horn.

" Previous to your leaving England, or at any rate before your departure from Shetland, you are to fix with Captain Buchan, to whom the other expedition is intrusted, upon a rendezvous in the Pacific; and if you should be joined by the Dorothea and Trent, or either of them, you are to take them under your command; and, having detached one ship, with a copy of all your papers, and a complete set of despatches reporting your proceedings, to England, by the route of Cape Horn, you are to proceed with the other ships to repass Behring's Strait, as above directed, if you should have determined on that course; but if you should have resolved to return by the South, you are to take care to interchange with Captain Buchan copies of your respective journals and despatches; or, if you do not meet Captain Buchan, or his ships, you are to deposit copies of your own papers on board the Alexander, in order to ensure, as far as possible, the arrival of these important documents in England, by thus multiplying the modes of conveyance.

"If, however, it should so happen, that from obstruction of ice, or any other circumstance, your progress to the westward should prove too slow to admit of your approach to Behring's Strait, before the present season shall be too far advanced, to make it safe to attempt that passage; and, at the same time, your progress should be too considerable to the westward, to ensure your return the same season by the way of Davis' Strait; you are, in that case, to edge down to the northern coast of America, and endeavour to find out some secure bay, in which the ships may be laid up for the winter; taking such measures for the health and comfort of the people committed to your charge, as the materials with which you are supplied for housing-in the ships, or hutting the men on shore, may enable you to do: and, if you shall find it expedient to resort to this measure, and you should meet with any inhabitants, either Eskimaux or Indians, near the place where you winter, you are to endeavour by every means in your power to cultivate a friendship with them, by making them presents of such articles as you may be supplied with, and which may be useful or agreeable to them: you will, however, take care not to suffer yourself to be surprised by them, but use every precaution, and be constantly on your guard against any hostility.

"You will endeavour to prevail on them, by such reward, and to be paid in such manner, as you may think best to answer the purpose, to carry to any of the settlements of the Hudson's Bay Company, or of the Northwest Company, an account of your situation and proceedings, with an urgent request that it may be forwarded to England with the utmost possible despatch.

"If, however, all your endeavours should fail in getting so far to the westward as to enable you to double the north-eastern extremity of America, (round which these Instructions have hitherto supposed a passage to exist,) you are, in that case, to use all the means in your power, by keeping to the northward and eastward, to ascertain to what extent you can proceed along the western coast of Old Greenland; and whether there is any reason to suppose that it forms a part of the continent of America; and you are also to endeavour to improve the very imperfect geography of the eastern coast of America, and of the island or islands which are supposed to intervene between it and Disco Island in Davis' Strait; but you are, on no account, in this latter case, to remain on this service so long, unless accidentally caught in the ice, as to be obliged to winter on any part of the eastern coast of America, or the western coast of Old Greenland, or the intermediate islands; but to leave the ice about the middle or 20th of September, or the 1st of October at the latest, and make the best of your way to the River Thames.

" Although the first, and most important, object of this voyage, is the discovery of a passage from Davis' Strait, along the northern coast of America, and through Behring's Strait, into the Pacific; it is hoped, at the same time, that it may likewise be the means of improving the geography and hydrography of the Arctic Regions, of which so little is hitherto known, and contribute to the advancement of science and natural knowledge.

" With this view, we have caused a great variety of valuable instruments to be put on board the ships under your orders, of which you will be furnished with a list, and for the return of which you will be held responsible; and have also, at the recommendation of the President and Council of the Royal Society, ordered to be received on board the Isabella, Captain Sabine, of the Royal Artillery, who is represented to us as a gentleman well skilled in astronomy, natural history, and various branches of knowledge, to assist you in making such observations as may tend to the improvement of geography and navigation, and the advancement of science in general. Amongst other subjects of scientific enquiry, you will particularly direct your attention to the variation and inclination of the magnetic needle, and the intensity of the magnetic force; you will endeavour to ascertain how far the needle may be affected by the atmospherical electricity, and what effect may be produced on the electrometer and magnetic needle on the appearance of the Aurora Borealis. You will keep a correct register of the temperature of the air and of the surface of the sea; and you will frequently try the temperature of the sea, in various situations and at different depths. You will cause the dip of the horizon to be frequently observed by the dip-sector invented by Doctor Wollaston; and ascertain what effect may be produced by measuring that dip across fields of ice, as compared with its measurement across the surface of the open sea. You will also cause frequent observations to be made for ascertaining the refraction, and what effect may be produced by observing an object, either celestial or terrestrial, over a field of ice, as compared with objects observed over a surface of water; together with such other meteorological remarks as you may have opportunities of making. You are to attend particularly to the height, direction, and strength of the tides, and to the set and velocity of the currents; the depth and soundings of the sea, and the nature of the bottom; for which purpose you are supplied with an instrument better calculated to bring up substances than the lead usually employed for this purpose.

"For the purpose, not only of ascertaining the set of the currents in the Arctic Seas, but also of affording more frequent chances of hearing of your progress, We desire that you do frequently after you shall have passed the latitude of 65° North, and once every day when you shall be in an ascertained current, throw overboard a bottle, closely sealed, and containing a paper stating the date and position at which it is launched; and you will give similar orders to the Commander of the Alexander, to be coocuted in case of separation. And for this purpose, we have caused each ship to be supplied with papers, on which is printed, in several languages, a request that whoever may find it should take measures for transmitting it to this office.

" And, although you are not to be drawn aside from the main object of the service on which you are employed, as long as you may be enabled to make any progress, yet whenever you may be impeded by ice, or find it necessary to approach the coasts of the continent or islands, you are to cause views of bays, harbours, headlands, &c. to be carefully taken, to illustrate and explain the track of the vessels, or such charts as you may be able to make: on which duty, you will be assisted by Lieutenant Hoppner, whose skill in drawing is represented to be so considerable, as to supersede the necessity of appointing a professional draughtsman.

" You are to make use of every means in your power, to collect and preserve such specimens of the animal, mineral, and vegetable kingdoms, as you can conveniently stow on board the ships: and, of the larger animals, you are to cause accurate drawings to be made, to accompany and elucidate the descriptions of them. In this, as well as in every other part of your scientific duty, we trust that you will receive material assistance from Captain Sabine.

"You are to use your best endeavours, and give instructions to the same effect to Lieutenant Parry, to keep the two vessels constantly together, and prevent their separation: if, however, they should separate, you are to appoint Lerwick, in the Shetland Islands, as the first rendezvous, and, after that, Love Bay, Disco Island, in Davis' Strait; beyond which, as nothing is known, no other rendezvous can be appointed. And in the event of any irreparable accident happening to either of the ships, you are to cause the officers and crew of the disabled ship to be removed into the other, and with her singly, to proceed in prosecution of the voyage, or return to England, according as circumstances shall appear to require: should, unfortunately, your own ship be the one disabled, you are, in that case, to take the command of the Alexander: and, in the event of your own inability, by sickness or otherwise, to carry these instructions into execution, you are to transfer them to the Lieutenant next in command, who is hereby required to execute them in the best manner he can, for the attainment of the several objects in view.

"As, in all undertakings of this nature, [illegible] veral emergencies may arise, against which no foresight can provide, and no specific instructions can be given; you are, in all such cases, to proceed in such a manner as you may judge to be most advantageous to the service on which you are employed; most likely to advance the accomplishment of the various objects of the expedition; and most conducive to the security of the ships, and the health, comfort, and safety, of your officers and men.

"On your arrival in England, you are immediately to repair to this office, in order to lay before Us a full account of your proceedings in the whole course of your voyage: taking care, before you leave the ship, to demand from the officers and petty officers the logs and journals they may have kept; and also from Captain Sabine such journals or memoranda as he may have kept; which are all to be sealed up: and you will issue similar directions to Lieutenant Parry and his officers; the said logs, journals, or other documents, to be thereafter disposed of as We may think proper to determine.

"His Majesty's Principal Secretary of State for Foreign Affairs has been requested to apply to the courts of Russia, Denmark, and Sweden, to issue orders to their respective subjects, to afford any hospitality or assistance which these expeditions may be in a situation to require and receive: the Court of Russia has been particularly requested to give directions to the authorities at Kamtschatka, for the safe conveyance of any despatches you may intrust to them; and the Courts of Denmark and Sweden have been requested to order any of their ships, whether national or private, which you may fall in with, to treat you with amity, and to note carefully in their logs the situations in which they may see any of His Majesty's ships. You will, on your part, behave with cordiality and friendship to any foreign vessels you may fall in with, or the authorities of any port or place at which you may touch: and on all such occasions, you will not fail to address to Our Secretary, for Our information, a general account of your proceedings up to the date at which the opportunity of conveying your despatch may occur.

" Given under Our hands the 31st of March, 1818.

" MELVILLE.
" J. S. YORKE.
" GEO. HOPE.
" G. MOORE."

To
John Ross, Esq., Commander
of His Majesty's Sloop Isabella.

By Command of their Lordships,
J. W. CROKER.

APPENDIX, No. II.

ON THE

DEVIATION OF THE MAGNETIC NEEDLE:

GIVING AN ACCOUNT OF EXPERIMENTS MADE ON BOARD HIS MAJESTY'S SHIPS ISABELLA AND ALEXANDER,

ON A VOYAGE OF DISCOVERY TO THE ARCTIC REGIONS:

TO WHICH ARE ADDED,

RULES THENCE DEDUCED FOR CORRECTING A SHIP'S COURSE.

BY

JOHN ROSS, CAPTAIN, ROYAL NAVY.

INTRODUCTION.

The following Article, on the Variation of the Compass and the Deviation of the Magnetic Needle, is offered as a Collection of facts towards the elucidation of this very important subject.

The manuscript was submitted to the Board of Longitude and Royal Society, where it has been read and approved; and I am authorized by the President, Sir Joseph Banks, to say that he would have proposed its being printed in the Philosophical Transactions, had he not been informed that it was to be published in the Narrative of the Voyage; after which it was not consistent with the regulations of the Royal Society to print it.

JOHN ROSS.

ON THE

VARIATION OF THE COMPASS,

AND

DEVIATION OF THE MAGNETIC NEEDLE.

SINCE the first discovery of the polarity of the magnet, and the consequent invention of the mariner's compass, great improvements have been made in its construction, and some very unexpected magnetical phenomena have been discovered. That instrument was in use for some years, before it was known that the needle had any deviation from the true polar direction. About the middle of the sixteenth century this began to be suspected; and observations which were made soon afterwards, proved that, in England and in its vicinity, it was Easterly. This Easterly variation decreased until about the year 1658 or 1660, when the direction of the needle corresponded with the meridian. After that time it became Westerly, and continued gradually for a long period of time to [illegible] uantity. In the course of [illegible] ations it was found to differ in different parts of the world. Hence it became absolutely necessary, both on this account and because of the gradual alterations to which it was subject, that mariners should be furnished with the means of daily ascertaining, in every situation, the quantity of error, or variation, of the compass, in order to correct the courses to be steered, and the bearings of objects seen. In ascertaining the quantity of this variation by the well known methods, the result was, till within a few years past, generally believed to be correct; or, at least, not subject to much error. Differences in these results were however at length observed by modern navigators, particularly by Mr. Wales, the astronomer, who accompanied Captain Cook in his third voyage; these differences being from 3° to 6°, and even 10°, with the ship's head in contrary directions: under various other circumstances, mentioned in the Introduction to Cook's Voyage, they were from 3° to 7°.

It was reserved, however, for that able and scientific navigator, the late Captain Flinders, to elucidate this interesting fact; to explain the probable, and till then the unsuspected, cause of this aberration of the needle; to draw conclusions, and to lay down a rule for correcting the error of variation, occasioned by changing the ship's head, which, under the circumstances, and within the limits of his observation and experience, were probably legitimate and correct. But the principle on which this rule is founded, will not be found applicable to every circumstance, and to all situations, and particularly where it has now been put to the test, in Baffin's Bay.

The memoir, written by Captain Flinders on this subject, is recorded in the Philosophical Transactions of the Royal Society for the year 1805; from this, it appears to have been his opinion, that the error of variation, consequent on a change in the direction of the ship's head, was produced by the combined force of terrestrial magnetism, and "ferruginous attraction" within the ship.

In the year 1812, the Lords Commissioners of the Admiralty ordered experiments to be made on board of five different vessels, in the King's ports, "with a view of ascertaining the particular causes of error to which Captain Flinders had adverted; or of obtaining some general results from an inquiry so intimately connected, as it appeared to be, with the im-

"provement of navigation." These experiments, as far as they went, tended to establish the fact, and to justify the opinion of Captain Flinders. Still, however, more information was wanted respecting this subject, for the purpose of discovering a rule that would enable observers to find the true quantity of error in any place, and under all circumstances.

Although the experiments above mentioned gave some insight into the causes of this variation, they were insufficient to explain them perfectly; nor is it probable that we shall soon be acquainted with them, ignorant as we are of the nature of many physical appearances of familiar occurrence. Though it would, perhaps, be possible, in the present highly improved state of navigation, for one, thoroughly versed in seamanship and nautical astronomy, to conduct a ship in safety from England to any port in the world, without the aid of the mariner's compass; yet, in cloudy tempestuous weather, or in confined waters, and surrounded by land, his doubt and anxiety could only be relieved, or confidence given to his mind, by the compass. It is, therefore, necessary, that this instrument should be rendered as unerring a guide as possible; and this can only be done by a certain universal and invariable mode of finding the *true variation*, at all times and places, and under all circumstances.

This irregularity of the compass being one of the important objects of the Expedition under my command, it became my duty to examine the various reports and publications on the subject, and to endeavour to ascertain how far the different systems given to the Public are correct and the rules for correcting the deviation of the variation to be depended on. Every possible opportunity was embraced during the voyage of taking observations, and of making all the necessary experiments and comparisons. These, with their results, will be detailed progressively, as they were taken in each month, together with the steps which I deemed necessary to come at the truth.

EXPERIMENTS

MADE ON BOARD HIS MAJESTY'S SHIP ISABELLA

IN THE MONTH OF MAY, 1818.

1st *Experiment on the Difference between the Compasses of the Isabella and Alexander.*

The signal was made to steer N.W. by W.; and when the Isabella was on that course, and the masts of both ships were in one, the Alexander was N.W. ½ W.

2d Experiment.—The signal was made to steer West; and when the Isabella was on that course, the Alexander was W. by S., the masts of both ships being in one.

3d Experiment.—The signal was made to steer S.W.; and when the Isabella was on that course, the Alexander was S.S.W. ½ W., the masts of both ships in one.

And, in like manner,—

With the Head	N.,	and Isabella	N.,	the Alexander	N. ½ W.
Do.	N.E.,	do.	N.E.,	do.	N.E. ½ E.
Do.	East,	do.	East,	do.	E. S.
Do.	S.E.,	do.	S.E.,	do.	S.E. ½ S
Do.	South,	do.	South,	do.	S. ½ E.

When the compasses were carried on board the Alexander, to be compared with the ship's head S.W., there was a difference of one point between the Isabella's azimuth compass and the Alexander's. Jennings's insulated compass stood at a medium between them, and one of the other compasses had half a point difference to the west.

The operations were repeated, but never gave the same results; so that no rule could be laid down, *at this time*, to correct the deviation.

EXPERIMENTS AND OBSERVATIONS

MADE IN THE MONTH OF JUNE, 1818.

On the 4th of June, in latitude 65° 44′ N., and longitude *54° 46′ 30″* W., observations were made, as nearly as possible, at the four cardinal points, which gave the following results:—

		VARIATION.			
		°	′	″	
Ship's Head	North, - -	60	50	15	West.
Do.	South, - -	*52*	*25*	00	
Do,	E.S.E. - -	48	10	00	
Do.	West, - -	*77*	33	30	
	Mean	59	44	41	

Ship's Head N. 17° E. - 58 01 00 West.

The mean of the Alexander's observations on the 4th June, was *56° 55′* 10″ W.; but the observations with the ship's head West is not included, as Lieutenant Parry reported that the ship was unsteady when on that point.

June 9th. The variation was observed by azimuth on the four cardinal points of the com-

pass, the mean of which gave 5° more than the true variation observed at the same time on an iceberg, which was - - 67° 10′ 00″ West.
On board Isabella, with her
head West, the variation
was observed to be - - 72 10 20 West.

And, at the same time, when observed with the ship's head N. 14° E., it gave 67° 8′ West, agreeing nearly with that on the iceberg. Azimuths were then taken 20° on each side of N. 14° E., and their mean gave the same result.

June 19th. The following bearings were taken of a distant object, which bore North from the ice out of the ship's attraction:—

SHIP'S HEAD.	OBJECT.	SHIP'S HEAD.	OBJECT.
	° ′		° ′
North - -	N. 4 — W.	E.S.E. -	N. 13 25 W.
N. by E. -	N. 1 — E.	N. by W. -	N. 8 15 W.
N.N.E. -	N. 1 — W.	N.N.W. -	N. 10 45 W.
N.E. by N.	N. 4 — W.	N.W. by N.	N. 12 00 W.
N.E. - -	N. 8 — W.	N.W. - -	N. 13 45 W.
N.E. by E. -	N. 10 30 W.	N.W. by W.	N. 13 50 W.
E.N.E. - -	N. 11 45 W.	W.N.W. -	N. 13 15 W.
E. by N. -	N. 12 30 W.	W. by N. -	N. 12 20 W.
East - -	N. 13 30 W.	West - -	N. 10 20 W.
E. by S. -	N. 14·00 W.	W. by S -	N. 7·50 W.

The variation of the Observatory was found to be 72° 46′ W.: while on board, with the ship's head N.N.W., it was observed to be - - - 83° 00′ West.
From which, subtracting 10 45 the deviation at N.N.W.

Leaves true variation, 72 15 West.

The foregoing observations and experiments, made under favourable circumstances, tend to establish several important points: —

1st. That there is a *point of change* in the deviation, occasioned by the attraction in the ship.

2d. That the point of change was not the magnetic north, but *near* it, in the Isabella.

3d. That it varies in different ships, and is affected by an increase or decrease of the variation, by proximity to land, or by that of another ship.

4th. That the point of change may be found by azimuth, or else by the bearing of a distant object situated near the magnetic north or in any other direction, if that cannot be had.

RULE.

Take an azimuth, or the bearing of a very distant object by the azimuth compass, with the ship's head at different points East and West of North, until the points of least and greatest deviation are found; the mean of these will be nearly the point of change.*

EXAMPLES.

On the 19th of June an object bore N. 4° W. by compass; and the ship's head, by means of a rope fastened to the iceberg, was in succession brought to eight points of the compass, by which it was found that the point of change in the deviation was N. 17° E.

1st. On the 19th of June, with the ship's head N.N.W., the variation observed on board was - - - - - 83° — West.

Difference of bearings between the ship's head and the point of change - - Increasing 10 45

True variation, - - 72 15 W.

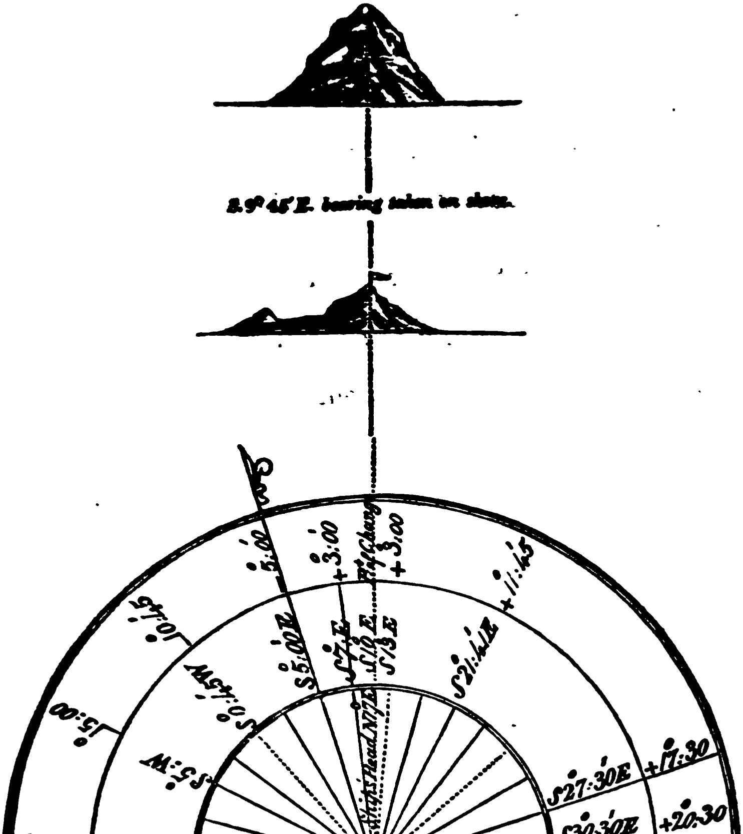
---

* This rule was found subsequently not to be applicable in all cases.

	° ′
2d. On the 19th of June, with the ship's head N.E., the variation observed on board was - - - - - - - - - -	64 20 W.
Difference of bearings between the ship's head and point of change - - Decreasing -	8 00
True variation,	72 20 W.

It is evident, that azimuths taken on each point will have the same effect, and therefore no example is required.

It is, however, necessary to observe, that this point of change was calculated from the compasses in the binnacle, which agreed with the azimuth compasses placed *amidships, half way between the mizen-mast and capstan;* but the point of change may be altered by setting the compasses in any other position in the ship; and particularly by shifting them from midships to the side. Finding the point of change thus subject to alteration, by changing the position of the compasses, and the angle of deviation itself materially affected by heat and cold, as well as by the humidity and density of the atmosphere; to obviate these difficulties, a binnacle was constructed to stand always exactly in the spot above mentioned, and fitted with a funnel for the conveyance of heated air, that an equal degree of temperature might be preserved within it. The temperature was above the freezing point during the time that all the foregoing experiments and observations were made.


S. 9° 45' E. bearing taken on shore.
Ship's Head N ½ E
Var. Chang
S 5:00 E
− 5:00
S 7 E
+ 3:00
S 10 E
S 13 E
+ 3:00
S 21:45 E
+ 11:45
S 27:30 E
+ 17:30
S 30:30 E
+ 20:30
S 0:45 W
10:45
S 5 W
15:00
S 12 W
22:00
S 12 W
22:00
S 8 W
16:00
The Wind being SW b W ½ W. no Observation could be made with Ship's Head farther South.

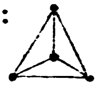
EXPERIMENTS AND OBSERVATIONS

MADE

ON BOARD H. M. S. ISABELLA, IN JULY, 1818.

A FLAG-STAFF was erected upon the highest part of the Three Islands, in lat. 74° 1′ 15″ N. and long. 57° 45′ W.; from whence the exact bearing was taken by Kater's compass, of a remarkable spot on a sugar-loaf mountain, nine miles distant. The ship then stood to the offing three miles, until the flag-staff and spot were in one. Between the inner and middle circles of the annexed figure, the transit bearings are inserted, when the ship's head was on the several points of the compass, and drawn to correspond in line. For instance, with the ship's head North, the two objects in one, bore S. 5° E.; and when the ship's head was N.E. they bore S. 21° 41′ E.; and so of the rest. It is clear, that the point of change is between N. by E. and N.N.E., as represented; for when the ship's head was N. 17° E., the transit bearing of the two objects agreed with that taken on shore; the deviation immediately increasing the variation to the west, and decreasing it to the east.

Between the middle and outer circles, will be found the degrees and minutes to be added to, or subtracted from, the variation observed, with the ship's head on any of the particular points of the compass corresponding in line, for the purpose of obtaining the true variation; or to obtain the true course, if steering on any of those points.

These observations were made on board, with Walker's, Alexander's, Jenning's, and Burt's compasses; all of them agreeing. But Jenning's and Burt's did not traverse sufficiently quick to obtain all the results with them. The four compasses used, were always kept in the same stations, where they were found to agree with those in the binnacles. The compass in the centre was so raised above the other three, that each was three yards equidistant from it, and from the rest; the whole four forming a solid pyramid, thus: 

The Alexander made the same observations. Her point of change, however, was to the Westward of North, and her deviation rather exceeded the Isabella's; but her compasses having been shifted during the operation, no conclusion could be drawn, but that the deviation existed to a great degree, though in what various proportions, was not ascertained.

I was desirous to determine whether the quantity of iron on board the Isabella was the cause of this extraordinary deviation; and how far my conclusions were applicable to the ships employed in the Davis' Strait Fishery. For this purpose, I went on board the Harmony of Hull, M‘Bride, master, the senior in the trade. I took with me two of the compasses with which I had observed, and found them exactly to agree with those in her binnacles. Having gone through the same observations, I found her deviation to be full two points each way; or, 45° difference between the bearings of the objects when the ship's head was W. by N. and when E.N.E.; on which points her extremes were found. The wind was S. by W. true, but when the ship's head was to to the Westward, she lay up only W. by N. the wind *appearing* to be S.W. by S.; and with her head to the Eastward, she lay E. by S. the wind then *appearing* to be S. by E. Every surrounding object, such as icebergs, &c., altered their bearings in the same proportion.

Mr. M‘Bride, who gave me every assistance in his power, by placing his ship on every point I desired, told me, that during twenty voyages he had made to this part of the world, the wind *appeared* to him often to shift when the ship was in stays; and that he attributed to the effect of currents the ship's not fetching so far to windward as he expected. It was, however, the general opinion and belief, that compasses lost their magnetic virtue in Davis' Strait; and, therefore, the whalers seldom look at them, steering by the land whenever they have an opportunity.

ISABELLA'S DEVIATION.

The Isabella's deviation was obtained during the time she was impeded by ice, between the latitude 75° and 76° N., and when the variation was between 86° and 96° W., by various and repeated observations made on the ice, and on board the ship with her head on every point of the compass. No alteration in its amount was perceptible between the latitudes of 71° and 76° N., although the variation had increased from 75° to 110° W. But it was found to be considerably increased by humidity in the atmosphere; and frequently, no compass in the ship was of any use except Alexander's, the card of which was suspended in a superior manner for the purpose of diminishing the friction. Being, also, lighter and smaller, and the needle powerfully magnetized, it traversed, when all others had ceased to act; but, on the 31st of August, the weather being rainy and boisterous, and the ship having considerable motion, this compass also became useless. The ship was at that time in lat. 74° 30′ N., and long. 81° W., and for a short time, our course out of Lancaster Sound, which we had examined that day, was regulated by firing musquets to the Alexander. The rainhowever soon ceasing, the compasses again traversed. The variation on that day was ascertained to be 115° West, by a transit bearing of Capes Fanshawe and Byam Martin, taken when to the *westward* of them. The ship's head being on the point of change, they bore N. 53° E. from each other, or S. 53° W. from the ship. The weather being at that moment pretty clear, as it also was when the ship was to the *eastward* of these Capes, they were found to bear from each other S. 46° W., and from the ship N. 46° E. The variation on that day was observed in Possession Bay (which lies between them) to be 109° W., and the *true* bearing of the Capes was found to be N. 62° W.

On the 11th of September, in lat. 70° 35′ N., and long. 76° 55′ W., when the variation was observed to be 75° W., and the dip 84° 39′ 21″, the deviation had not decreased in the Isabella, nor was the decrease very perceptible till we had passed the 66th degree of north latitude. But, although the exact amount of the deviation was not ascertained, yet the bearings of the land were always found correctly, by placing the ship's head on the northern or southern points of change. The deviation was sometimes found to be more or less, according to the state of the weather, when the ship's course was resumed and the bearings of the same objects were taken.

The Diagram seems to prove clearly, that the points of change in the deviation do not alter, unless some material alteration is made in the stowage of the iron in the ship, as they continued the same in the Isabella for five months, whilst the variation had altered from 27° to 115° W.; the deviation itself differing only in amount, but that amount bearing a proportion, though not a regular one, to the increase and decrease of the variaton and dip. Notwithstanding these irregularities it may, by actual observations of the most simple nature, be always obtained sufficiently near the truth for the purposes of navigation.

ALEXANDER'S DEVIATION.

The Diagram, No. 2, contains the result of experiments made on board the Alexander, on the 27th July, 1818, in lat. 75° 30′ N. and long. 60° 30′ W., to show the difference between them and those which I afterwards made in the same ship, on her arrival at Shetland. Soon after we had forced the last barrier of ice, on the 16th of August, it was found that the Alexander sailed much worse than the Isabella, and it therefore became necessary to trim her. Iron casks, and other metallic substances, were removed from the quarter-deck, and in consequence her points of change were altered. The weather being subsequently unfavourable, and the season advancing, I had neither time nor opportunity to make further experiments on board of her. All the bearings of the coast, therefore, taken from the Alexander after that time, are of course of no value. But the amount of the deviation, as well as the points of change, altered in an extraordinary manner.

By the subjoined official Report, made to me by Lieut. Parry, it appears, that on the 28th of August, in the most interesting part of the voyage, the Alexander's deviation was actually greater than that of the Isabella, on some points; but we had no opportunity of determining either the direction, or the amount, until our arrival at Shetland; where, having examined part of the log of the Alexander, I found that where three or more bearings of headlands had been taken, they could not be made to intersect. But the charts on board the Alexander will show how much the ablest navigator may be led into error in their construction, when the points of change, and the amount of deviation have not been obtained, and where the variation is considerable.

His Majesty's Ship, Alexander, at Sea,
September 1st, 1818.

SIR,

I HAVE the honour to state to you, that the officers who have charge of the respective watches on board the Alexander, having, on the 27th and 28th ult., reported to me, that they had remarked a very perceptible inaccuracy in the compasses, by the ship's lying repeatedly within eight and half, eight, and even seven points, on both tacks; I took particular notice on several occasions, of the direction of her head by the compasses, before and after tacking, and found their report to have been correct. I select the following instances:—

Aug. 27th.

8.30 A.M.,	on the larboard tack,	W.b.S.	10 points (in original *).
„	starboard do.	S.S.E.	
5.30 P.M.,	larboard do.	W.N.W.	7 points.
„	starboard do.	S.W.b.S.	
about 9 P.M.,	starboard do.	S.W.	8 points.
„	larboard do.	N.W.	

Aug. 28th.

3 A.M.,	starboard do.	S.S.W.	8 points, (much swell)
„	larboard do.	W.N.W.	
6.30 P.M.,	larboard do.	N.W.b.W.½W.	8½ points.
„	starboard do.	S.S.W.	

By referring to the diagram of the experiments made on board the Alexander, under your direction, on the 27th of July, it appears that the deviation then found on any of the above courses is totally inadequate to account for such a difference; the amount being now almost as many *points*, in some instances, as it then was *degrees*.

This deviation has become less perceptible since the 28th and 29th, though it is still found frequently to be much greater than on the coast of Greenland.

I have the honour to be, *&c. &c.*
(Signed) W. E. Parry.

To Capt. John Ross,
H.M.S. Isabella, at Sea.

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* There are only nine points.

The Diagram, No. 2, exhibits the extraordinary alteration that was found to have taken place in the Alexander's points of change, which were now ascertained to be, both of them, to the Northward of East and West. It seems completely to prove, that the *ship's* attraction, or magnetism, is an independent force, and that its amount is affected (though by no means regularly) by that of the dip and variation, in a considerable degree.

The amount of the Isabella's deviation having been fully determined in the month of July, when the variation was between 80° and 90° West, it only remained to remark its increase, or decrease, as we advanced to the North and West; and how it might be affected by changes of climate. It is to be observed, that, until the 21st of August, almost daily opportunities of obtaining the deviation occurred, by taking from the ship, and on the ice, the bearings of distant objects. After the variation exceeded 90°, the deviation did not increase perceptibly; but humidity seemed to increase it considerably. When the ship was fast to the land-ice, in several instances there was a difference of 7° in the transit bearing of two distant objects, and with the ship's head on the points of greatest deviation, it increased from 22° to 29°. The variation might, however, have been increased by the same cause, as well as the deviation; for, in experiments made of the same kind, I never found so much difference when the variation and deviation had contrary tendencies. The greatest variation actually observed on the ice, was 110° W. in lat. 76° 45′ N., and long. 77° W. At Cape Byam Martin, in lat. 73° 33′ N. and long. 77° 10′ W., it was observed to be 109° west: but the bearing of two points in one, to the west of that Cape, being taken, first, in long. 81° west, and secondly, from Possession Bay, an increase of 7° was found (the hygrometer being nearly the same): hence the variation in 74° N. and 81° W., was ascertained to be 115°, having deducted 1° for the increase of deviation. Here it is to be observed that, in consequence of the alteration which is mentioned before to have taken place in the Alexander's points of change, of the discovery made on the 28th of August, that her deviation had increased, and of the points of change not having been determined till our arrival at Lerwick, all the bearings of places in the log of that ship from the day that alteration took place till our reaching Shetland, are incorrect, and cannot be reduced to truth. As I have before observed, they cannot be made to intersect; and there is one remarkable instance where Cape Walsingham has been brought so far to the eastward, as to place it considerably on the outside of the Isabella's track. On board of the Isabella, on the contrary, in reference to several days' works, given in full in the journal I kept, it will be found, that the reckoning and observations agree so well, as completely to prove that the variation can be corrected to the nearest degree; and consequently, the true courses to be steered, and the bearings of objects, may be found with the greatest accuracy. In my Journal, the variation, corrected for the deviation, is given on every course, in a column next to the compass courses.

After the 1st of September, no good opportunity occurred for ascertaining the deviation; but it was found to decrease rapidly after the variation was less than 60°. During the month of October, few observations were made, but the variation and deviation decreased together; and, on the arrival of the two ships at Lerwick, a set of experiments were made under my direction on board of each, which have been illustrated in the diagrams, Nos. 1 and 2.

The several facts to be gathered from all the experiments made at different times, appear to be the following:—

1st. That every ship has an individual attraction which affects the compasses on board of her; and to ascertain the exact quantity of its effect, though possible, requires the most particular care and the nicest attention.

2d. The effect of this attraction being different in different ships, and not always progressive, but often irregular, no general calculation will therefore apply in the case of all ships, so as to ascertain it for the purposes of correction; and, consequently, all the rules hitherto given for obtaining it, particularly in arctic climates, cannot be relied on.

3d. As six compasses were compared with each other on board the Isabella, and found to agree in the *same* place; and as they were all found to disagree when placed in different situations between the stern and the foremast, it is evident that the deviation in any ship will vary according to the station of the compass at the time of using it; and, therefore, as the point of change will not be the same at every part of the ship, all observations must be made in the same place, where the point of change has been obtained, since to that only will this correction apply.

4th. The deviation does not always continue the same under the same apparent circumstances, but varies according to the point on which the ship's head lies.

5th. The deviation appeared to be materially affected by heat and cold, as well as by variations in the humidity and density of the atmosphere.

6th. The direction of the wind seems to have an effect in disturbing the regularity of the deviation.

7th. The force or quantity of the dip possesses a decided influence over the force or quantity of the deviation.

8th. Although the points of change found with the compass in the same part of the ship will remain the same, unless some material alteration is made in the stowage of the iron on board, yet the *amount* of the deviation with the ship's head on any point of the compass, will bear a proportion, though not a regular one, to the increase or decrease of the variation and dip; by both of which it appears in some degree to be governed, though the points of change are not; as they seem to be independent of any influence, except that of the [illegible] attraction or magnetism; which is not of *equal* force in every part of the same ship, nor, perhaps, alike in any two. It is, however, presumed, that the experiments and observations which have been made, together with the foregoing rules, as exemplified on the 4th and 19th of June, and in the month of July, at the Three Islands, will be sufficient to correct the errors in the mariner's course, which have so often proved fatal; and which have hitherto been attributed to defects in the compasses, to currents, and to other unaccountable causes.

In conclusion, it only remains further to explain:—

1st. How the deviation may be obtained, when the variation of the compass has been found by observations made, out of the influence of the ship; and,

2dly. How the true variation on board of a ship at sea may be ascertained, when the variation is not known.

The first is an easy process, it being only necessary to find the point of change, and the difference on the point steered.

RULE

To find the Point of Change in Deviation.

Let the bearing of one, or the transit of two distant objects, (whose *true* bearing from the ship, or from each other, is known,) be taken, with the ship's head at several points of the compass; if they all agree, the ship has no deviation; but, if not, the *one* which is found to *agree* is the point of change.

RULE

To find the Deviation for the Point steered.

Let the bearing of the same object be taken, with the ship's head on the point of the course steered; and add, or subtract, the difference between them, as it increases, or decreases, the variation.

To find the deviation at sea when a distant object is in view, the true magnetic bearing of which is not known: let a boat be sent out of the ship's attraction, to take the bearing of the object, and then the bearing of it is to be taken from the ship, in the manner before described. But even when [illegible] object is in view, it can be [illegible] with smooth water, by veering a boat (copper-fastened) astern with a compass. The ship is then to steer on different courses, (the boat always keeping her masts in one,) until the compasses of the ship and boat agree. If there is no difference between them on any point, the ship has no deviation. But whatever difference is found between them on any point, that is the ship's deviation for *that* particular point, and must be added, or subtracted, to correct the ship's course on *that* point, according to the true magnetic course of the boat. And, in like manner, the respective differences found on the several points are to be applied to each. On whatever point the courses of the boat and the ship agree, when her masts are in one, *that* is the ship's point of change. The result of observations made with the ship's head on *this* point will give the true variation of the compass; but if observed on any other points, the error of variation will be according to the amount of the deviation, or differences found on those points respectively, between the course of the ship and the boat, and must be applied + or —, as the case may require, to correct it. The variation may be observed, either before or after this process, for finding the ship's point of change and deviation; and if amplitudes, or azimuths, are taken at different parts of the ship, the difference between the azimuth compass (wherever it may stand,) and the compass the ship steers by, ought always to be taken, and applied in like manner to obtain the *true* variation.

It would be of great benefit to navigation if the bearings of remarkable head-lands, and other objects, on the coasts of different countries, were *correctly* taken, and inserted in the published charts. Thus, a ship, able to approach near enough to take the transit bearing of any two such objects, whose relative situations were exactly laid down, could thus know at once her *deviation*, on whatever course she was steering, (if the true variation was on the charts,) since it would be the difference between that and the true transit bearing as laid down on the chart; taking into consideration, at the same time, the known variation. For instance, let a ship be supposed steering west (by compass), along a coast where two remarkable objects are situated *true* north and south of each other, and the variation laid down on the chart to be 29° west. On setting these objects in one line from the ship, they are found to bear by compass N. 24° E. making a difference of 5° for her deviation *on* the *west* point. So that if she had now to steer a correct *magnetic* west course, it must be shaped W. 5° S.; or to make a *true* west course, W. 24° N. according to the variation of 29° west.

If, again, with her head N. by E. she finds the transit bearing of the two objects to be N. 29° E. by compass, agreeing with that laid down on the chart according to the variation, *that* is the point of change, because there is *no deviation*.

Again, if in steering east by compass, she finds the transit bearing of the two objects to be N. 34° E. by compass, the difference between it and that on the chart, according to the variation, being 5°; to shape a correct magnetic east course, she must steer E. 5° S.; or, to make a *true* east course, E. 34° S.

Men-of-war, and, indeed, all ships, should, at every opportunity, try the deviation, and ascertain their points of change; and that being once found, no change should be made in the stowage or position of any of the larger masses of iron on board.

COMPARISON OF OBSERVATIONS FOR VARIATION TAKEN ON THE ICE, WITH THOSE TAKEN ON BOARD WITH THE SHIP'S HEAD ON DIFFERENT DIRECTIONS.

1818.	Latitude.	Longitude.	Variation on the Ice.	Variation on Board.	Ship's Head.	Difference.	Remarks.
	° ′ ″	° ′ ″	° ′ ″	° ′ ″		° ′ ″	
June 27	71 02 24	54 13 13	75 18 20	60 59 00	East.	14 17 20	Minus } By bearings of dist. obj. the deviation was found to be 21° 30′, S. H E. b. ¼ S.
27	71 02 24	54 13 13	75 20 40	60 37 00	S. E.	18 43 40	Minus }
27	71 02 24	54 13 13	75 20 00	96 18 00	West.	20 58 00	Plus } By bearings of dist objects, the deviation was found to be 24, S. H. W. b. N. ½ N.
27	71 02 24	54 13 13	75 19 00	94 45 30	N. W.	19 25 30	Plus }
July 4	72 44 28	56 48 42	80 46 00	69 02 00	N. E. ½ E.	17 44 00	Minus Do. Do.
4	72 44 28	56 48 42	80 46 00	98 31 00	N. W.	17 45 00	Plus Do. Do.
7	74 03 37	58 53 00	81 02 00	102 16 00	W N. W.	21 14 00	Plus } The bearings of a distant object gave the same result.
27	75 26 00	60 30 00	88 20 00	112 28 00	W. b. N. ½ N.	24 8 00	Plus }
27	75 26 00	60 30 00	88 24 00	66 02 00	E. b. S. ¼ S.	22 28 00	Minus Do. Do.
30	75 30 26	61 04 22	88 00 00	112 02 00	W. b. N. ½ N.	24 02 00	Plus } Do. Do.
30	75 32 00	61 10 00	88 14 00	113 00 00	W. b. N. ½ N.	24 46 00	Plus }
Aug. 5	75 49 38	64 25 47	90 24 15	70 20 00	East.	20 04 00	Minus } Do. Do.
5	75 49 38	64 25 47	90 24 15	110 45 00	West.	20 25 00	Plus }
18	76 19 00	69 36 00	92 36 00	———	West.	20 40 00	Plus. By bearings of distant objects.
					East.	20 00 00	Minus. By Do. Do.
19	76 28 30	73 13 00	102 37 00	———	W. b. N.	25 00 00	Plus. By bearing of dist. object—clear & 29° } When the weather became foggy.
20	76 45 00	75 14 00	109 19 00	———	West.	20 00 00	By Do. clear 27°
					East.	18 00 00	— Do. Do. 21°
20	76 45 00	75 14 00	109 19 00	———	East.	21 00 00	— Do. Do. 25°
					West.	18 00 00	— Do. Do. 20°
Sept. 1	73 34 00	77 46 00	110 00 60	111 60 00	P. of Chang.	———	
	73 34 00	77 46 00	110 00 00	———	W. b. N., N.	135 00 00	— Do. Do.
					E. b. S. ½ S.	87 00 00	— Do. Do.

OBSERVATIONS ON THE DIP AND INTENSITY OF THE MAGNETIC FORCE.

Month.	Date.	Latitude.	Longitude.	Dip.	No. of Observations.	In the Mag. Merd. 100 Vibrations in	No. of Observations.	Right angles to the Mag Merd. 100 Vibrat. in	No. of Observations.	Remarks.
		North.	West.	North.		m. s.		m. s.		
April	30	*Brassa in*	*Shetland.*	74 22 48	14	7 50 15	4	8 01 25	4	
June	9	68 22 15	53 49 55	88 08 07	12	7 20 00	2	7 33 00	1	On Ice in Davis' Straits, E. Coast distant 5 miles.
——	19	70 26 17	54 51 49	82 48 47	14	7 23 00	2	7 26 00	1	Waygatt Islands, at the Observatory.
July	8	74 04 00	57 52 00	84 09 15	10	- -	-	- -	-	On the 3 Islands of Baffin.
——	23	75 05 00	60 03 00	84 25 06	10	7 27 25	2	7 26 00	1	On Ice, the land dist. 10 m.
Aug.	2	75 51 30	63 06 00	84 44 33	10	7 27 25	2	7 24 50	1	Ditto, Ditto 8 miles.
——	4	75 59 00	64 47 00	84 52 06	10	- -	-	- -	-	Ditto, Ditto 8 miles.
——	19	76 32 00	73 45 00	85 44 38	11	- -	-	- -	-	On Ice, Carey's Islands bearing N.N.E. 15 miles.
——	20	76 45 30	76 00 00	86 09 33	12	7 15 00	2	7 16 00	1	On Ice, Cape Clarence bearing W. 7 leagues.
——	25	76 08 28	78 20 50	85 59 19	16	7 16 00	2	7 18 00	1	On Ice, land 7 miles distant.
Sept.	11	70 35 30	66 55 00	84 39 21	10	7 16 00	2	7 18 05	1	Ditto, land 12 miles distant.
Nov.	3	*Brassa in*	*Shetland.*	74 21 50						

APPENDIX, No. III.

GEOLOGICAL MEMORANDA.

The following pages constitute all the information which I have to give respecting the geological history of the countries which we visited.

As no one in the expedition was acquainted with this subject, nothing more could be done, than bring on board a specimen of every rock that occurred; but being alike unacquainted with the substances, with the mode of collecting them, and unaware of the necessity of making observations on the disposition and connections of the strata, much information must not be expected.

For the names of the specimens collected, I have been obliged to apply for assistance to Dr. M‘Culloch, who has kindly furnished me with the following catalogue.

GEOLOGICAL MEMORANDA.

The following is a catalogue of the specimens which were subjected to my examination by Captain Ross. They appear to have been collected without care, and with no attention to their relative situations; the greater number, indeed, being casual fragments, or pebbles picked up on the shore. No direct observations were recorded, for the purpose of throwing light on them; either respecting the forms of the land, or the appearances of stratification, or otherwise, so often visible, even at a distance, on sea-coasts. The little additional illustration which they admit, was furnished by Captain Ross's observations, made with other views, and by some of his very characteristic drawings of the land. I have to regret that I had no means of adding any thing to render this very meagre list more interesting, without indulging in unwarrantable conjectures.

The detached situation of the only three spots, of which the examination is at all tolerable, namely, Waygatt Isle and the adjacent shore, Prince Regent's Bay, and Possession Bay, is such as to prevent any general conclusion respecting the structure of this extensive region. If it were justifiable to draw such a conclusion from the characters of those tracts, it might be supposed that the whole country in the interior consisted of granite and gneiss; or, at least, that these were the prevailing rocks. It is at the same time evident, that some of the shores are skirted by secondary strata, of which the proof is to be found, not only in the nature of the rocks described, but in the appended list of soundings, which, in some instances, prove the existence of secondary limestone. It is impossible, however, to pass from this subject, without pointing out a remarkable circumstance; namely, that in three out of the four places of this extensive bay that were examined, there are indications of a trap formation. It would be a singular chance, if this should exist only in those three spots; and on any calculation of probabilities, it is likely that the trap rocks will be found to form a very characteristic feature on the shores of Baffin's Bay, should future navigators have time to investigate them.

As these are among the most limited and partial of the several classes of rock, their occurrence here through so extensive a range, should it prove to be the fact, could not fail to be considered an interesting circumstance.

CATALOGUE OF THE SPECIMENS

OF

ROCKS AND MINERALS

BROUGHT BY

CAPTAIN ROSS FROM DAVIS' STRAIT AND BAFFIN'S BAY.

SPECIMENS FOUND ON AN ICEBERG,

In Lat. 68° 22′. *Long.* 53° 47′.

SEVERAL varieties of granite and gneiss.

These present the most ordinary characters, and require no notice as specimens.

Basalt.

The iceberg from which these specimens were brought, was met with on the east coast of Davis' Strait. It is uncertain, of course, whether it was formed on the shore nearest to the actual position of the ship; and it cannot, therefore, indicate any thing respecting the nature of the country, which, by Captain Ross's account, presented a rocky coast, skirted by islands, and rising in the interior into high mountains.

SPECIMENS FROM WAYGATT ISLAND.

Lat. 70° 26′ N., Long. 54° 40′ to 55° W.

Granite of different aspects.

Gneiss, also of different aspects; some of them, as well as a few of those mentioned in the former article, containing green compact felspar.

Quartz rock.

Graywacke schist.

Gray earthy amygdaloids, containing nadelstein and brown spar; the latter crystallized, of a dark, and of a red-brown colour: the cavities are also frequently empty.

Brown clay stone.

Siliceous iron stone.

Common argillaceous iron stone.

Red iron clay.

Semi-opal.

Chalcedony, in laminæ, apparently formed in the fissures of a rock; and also in crusts with a botryoidal surface.

Cacholong and chalcedony interlaminated, and resembling the specimens brought from Faroe and Iceland.

Geodes of chalcedony, with crystals of quartz in the interior.

Nadelstein, apparently washed out of amygdaloidal trap.

Wood coal, resembling that found under the trap rocks in the Western islands of Scotland.

A flint, of the same nature as those found in the London gravel.

Quartz, apparently from veins.

From these specimens, a tolerable conjecture may be formed of the general structure of this island; some assistance having been also derived from an accurate drawing of the north-east shore, made by Captain Ross; from which the relative space occupied by the trap rocks above indicated, seems capable of being determined.

The general outline of the interior, and of a considerable proportion of the north and east coasts, bespeaks the existence of primary rocks; the hills rising to an average height of one thousand feet, and presenting acute summits, declining by sharp prolonged ridges.

Since the specimens of granite possess the character of that substance as it is found forming mountain masses, it is probable that this rock forms a portion at least of the country. The gneiss may be expected to constitute a much larger part, as far as a judgment can be formed from the characters of the hills as they are represented in the drawing. Both the quartz rock and the graywacke schist have the characters of these substances as they are found alternating with gneiss on the north-west coast of Scotland; but no further conjectures can be formed respecting their actual position.

Captain Ross informs me, that the specimens of chalcedony were found on the side of a mountain of about five hundred feet in elevation; that the rocks were naked and vertical, and appeared like the ruins of buildings. On consulting his drawing, it is apparent that there is a ridge of hills of the trap formation, skirting the shore for a space of about four miles, and interrupted in two places. This ridge rises to about half the general elevation of the island, and presents the vertical prismatic fracture at the summit, accompanied by the usual rapid slope below. The specimens of claystone and amygdaloid, as well as the chalcedonies and the nadelstein, are evidently derived from this mass of rock.

No specimens of secondary rocks were contained in this parcel, but the iron stones are similar to those found in the strata which, in England, accompany coal, and they indicate the probable existence of a body of secondary strata subjacent to the trap.

Of the origin of the flint, I cannot pretend to offer any conjecture. It would have been interesting to have traced it to its native rock, as it does not appear that any gravel is found in this island, analogous to that which in this country contains these flints. Should such flints be found an inmate of the trap rocks, it would throw light on a very interesting and difficult question in geology.

The wood coal is an interesting specimen. The structure resembles that of oak, and it is obviously part of a tree of considerable size; a circumstance of some curiosity in a spot where no tree now grows, or ever could have grown in the actual state of the climate. It presents a difficulty analogous to that of the surturbrand of Iceland.

SPECIMENS FROM FOUR ISLAND POINT.

Lat. 70° 46′, *Long.* 53° 3′.

Granite.

Different varieties of gneiss. One of the most remarkable of these consists of the most ordinary ingredients, with the addition of green compact felspar.

Hornblende schist.

Actinolite schist.

Argillaceous schists, varying between clay-slate and graywacké.

A coarse grey sandstone, belonging apparently to the secondary strata.

A very compact fine-grained basalt.

Greenstone.

Earthy amygdaloids, of a yellowish brown, and of a reddish colour; containing chalcedony, quartz, calcareous spar, and a yellowish chlorite, apparently in a state of decomposition.

An amygdaloid with a basis of black pitchstone, containing iron clay.

Chalcedonic nodules.

Pale grey chert.

Nodules of chalcedony.

Nodules of radiating arragonite.

Fibrous calcareous spar.

Mesotype.

Felspar, apparently from gneiss,

Quartz, apparently from veins.

Lieutenant Robertson informs me, that he here saw columns resembling those of Arthur's Seat, near Edinburgh, resting on a thick bed of clay as bright as vermilion. Captain Ross not having been on shore, no other observation accompanies these specimens, which, like almost all the rest in this list, consist of casual fragments, collected at hazard.

From the granite, the gneiss, the hornblende schist, the argillaceous schist, and the sandstone, it may be concluded that this part of the country presents examples both of the primary and the secondary rocks; and, from the aspect of the land, it is probable that the former are succeeded by a tract of the latter strata skirting the shore. The vermilion clay of Lieutenant Robertson is obviously the common iron clay which accompanies the trap rocks; the colour of which, when contrasted with the darkness of the surrounding substances, is sufficiently bright to justify this hyberbolical term. It is probable that the basalt is derived from these columns; the amygdaloids must be conceived to appertain to other parts of this deposit of trap, which is undoubtedly connected with the secondary sandstone described above.

The chert is probably connected with the trap rocks. It is not unusual to find it accompanying the argillaceous limestones, where these are traversed by large veins, or overwhelmed by masses of that rock.

The pitchstone amygdaloid presents a variety of which I have never seen a parallel example. To describe its basis accurately, it may be compared to that of the Scuir of Egg; adding only, that it occupies a station still nearer to true pitchstone; appearing to be as nearly intermediate between that substance and the rock of Egg, as this is between pitchstone and basalt. It is an interesting circumstance, as adding one more to the numerous analogies already existing between those two rocks.

The other specimens require no particular notice; but it may be remarked, that there is a general resemblance between all the rocks and minerals collected in this spot, and those brought from Waygatt's Island. As the distance between the two places is not above twenty miles, it may be imagined that the masses of trap in both, are parts of a common formation; and it is not unlikely, that the same general characters will be found to prevail to a greater extent along this coast.

SPECIMENS FROM THE THREE ISLANDS OF BAFFIN.

Lat. 74°. 1′, *Long.* 57° 25′.

Gneiss, abounding in garnets, and containing molybdena.

Massive brown garnet, breaking with flat faces parallel to those of a crystal, and of a pseudo-metallic lustre; it contains attached and imbedded crystals of brown hexagonal mica.

The gneiss is very remarkable for the large quantity of garnets it contains. These are often of a large size, and are invariably of a pale crimson colour, and transparent: they are all so much fissured as to be of no value; but it must be remarked, that no specimens of fresh rock were brought, the whole of them, on the contrary, being nearly rotten. This gneiss appears to split into thin and flat slates; but whether that, also, is not the consequence of decomposition, cannot be ascertained from the state of the specimens. The existence of molybdena in this form is, I believe, a fact hitherto unobserved: it is in minute scales, dispersed all through the rock so as to form an integrant part of the mass.

SPECIMENS FROM CAPE MELVILLE.

Granite.
Porphyry.

It might be presumed from the appearance of these specimens, that this Cape is a mass of granite, traversed by veins of porphyry; but the drawing seems to indicate stratification, from which it would be more natural to conclude that it consists of gneiss. The granite, however, does not appear to have been derived from veins. It is of little use to make conjectures on this subject.

SPECIMENS FROM BUSHNAN'S ISLE.

Lat. 76° 04′, *Long.* 65° 26′ *W.*

Granite.
Gneiss.
Micaceous schist.
Claystone.
Amygdaloidal claystone.

SPECIMENS FROM CAPE YORK,

KNOWN TO THE NATIVES BY THE NAME OF INMALLICK.

Lat. 76°, *Long.* 66° 46′ *W.*

A porphyritic greenstone. This is the substance used by the natives in cutting off their iron from the masses.

SPECIMENS FROM THE COAST BETWEEN CAPE YORK AND CAPE DUDLEY DIGGES.

Lat. from 75° 45′ *to* 76° 10′, *Long. from* 67° *to* 68° 40′

The specimens from this coast, which includes the Crimson Cliffs, resemble those from Bushnan's

Isle so precisely that it is unnecessary to enumerate them.

The tract of country from which the four parcels of specimens immediately preceding were brought, occupies a space on the shore of about sixty miles. The general characters of the land may be collected from the various drawings engraved for the journal of the voyage, and from the chart of Prince Regent's Bay. From both sources of information, imperfect as they are, it may be concluded that the country in general is of primary formation. From the forms of the mountains in the interior, it is probable they consist of granite; but, even respecting this, there can be no certain conclusion, as gneiss is found to assume forms equally rugged and acute. The cliffs, however, near the shore, present characters which can scarcely belong to the former rock; and it is, therefore, probable that they consist of gneiss, which seems to be the prevailing substance in those parts of Baffin's Bay actually examined by Captain Ross.

On considering the claystone of Bushnan's Island, and the greenstone of Cape York, it is apparent that here also, as at Waygatt's Island and Four Island Point, there is a trap formation; but it is impossible to conjecture the extent of it, as there are no observations accompanying these specimens, and the drawings of the coast have been taken from too great a distance to allow of any judgment being formed respecting the nature of the rocks.

SPECIMENS FROM POSSESSION BAY, AND CAPE BYAM MARTIN.

Lat. 73° 33′, *Long.* 77° 28′.

Granite of various aspects; some specimens containing garnets.

Gneiss of different kinds, some specimens containing pyrites, others garnets, and others again, green compact felspar.

Quartz rock.

Red sandstone.

Red shale.

Grey calcareous sandstone.

Grey argillaceous limestone.

Jasper.

Siliceous schist.

Chert.

Purplish and ochre-coloured amygdaloidal claystone.

Black basaltic porphyry.

Grey hard claystone porphyry.

Coloured agates.

Quartz, with imbedded garnets.

Felspar, with the same.

The greater number of these specimens consisted of rolled stones, gathered in the bed of a river, on a shingly beach, which is found near the sea at the foot of the cliffs. The mountains in the interior are very lofty; but no other information of a geological nature can be collected from the officers who landed in this place: the specimens, nevertheless, indicate a more complete series of rocks in this place, than in any of those examined during the expedition. There can be no doubt, from the shape of the land, as represented in the drawings, that the primary rocks occupy the high mountains in the interior, and reach also to the shore near Possession Mount. It is not so easy to conjecture the position of the secondary rocks, of which no decided indications appear in the external form of the land: the series of these is, however, very perfect, extending from the red sandstone upwards, and being finally covered, to all appearance, by a formation of trap. The jasper, the siliceous schist, and the chert, resemble exactly those specimens which are found in the Island of Sky, among the beds of shale, sandstone and limestone, when these are immediately in contact with the larger masses of trap; and, probably, they here also owe their origin to the same cause.

The quartz and the felspar, containing garnets, are probably derived from veins in gneiss, where similar appearances are not uncommon.

The agates must be referred to the trap.

With respect to the gneiss, which contains green compact felspar, and which appears to be of common occurrence on this coast, it may be remarked, that it is exactly similar to that which occurs abundantly in the Western isles, and more particularly on the western coast of Ross-shire, prevailing particularly about Loch Ew and Loch Greinord.

SPECIMENS FROM AGNES MONUMENT.

Lat. 70° 37′ *N.*, *Long.* 67° 30′ *W.*

Granite.
Gneiss.
Graywacke schist.

APPENDIX, No. IV.

ZOOLOGICAL MEMORANDA.

APPENDIX, No. IV.

ZOOLOGICAL MEMORANDA.

ZOOLOGICAL MEMORANDA.

Class MAMMALIA.

Genus, Homo (*Man*).

Two of the skulls found on Hare Island, as well as sketches of the natives found at Jacob's Bight, and Prince Regent's Bay, have been examined by Dr. Leach, who believes them to be pure Esquimaux.

Genus, Phoca (*Seal*).

Species 1. Phoca Barbata, (*Bearded Seal*,) killed on the 11th of June, in lat. 68° 23′ N., long. 55° 14′ W. A seal in its second year, according to the judgment of our Esquimaux.

Its length, from the tip of the nose to the extremity of the tail, was eight feet; its circumference, behind the fore flippers, five feet seven inches; weight, eight hundred and thirty pounds.

Fore flippers measured in length eleven inches,
in breadth six inches;
Hind flippers ...... in length sixteen inches,
in breadth two feet,
when expanded.

The claws of the former were black, horny, and curved; those of the latter were long and straight. Fingers five, middle ones longest in fore flippers. The body covered with thick, coarse, short, dark grey hair. The eyes about the size of an ox's, furnished with a nictitant membrane, irides dark hazel; the pupil elliptic perpendicular. No external ears; the auricular apertures placed about two inches behind the eyes. The upper lip broad, rounded, fleshy, divided into two lobes by a deep sulcus, or division, which is black and naked; each lobe is provided with eight rows of strong white bristles, semi-pellucid, and curled at the ends. The lower lip thin and pointed. Tongue thick, pointed, and cleft; upper surface papillous. Teeth, upper front six, truncate, small; tusks solitary, truncate; grinders three, the anterior one solitary; lower front four imperfectly developed; tusks small and obtuse; grinders seven, the two posterior imperfectly lobed, the rest being small long tuberosities, scarcely produced through the gum. The heart about the bulk of that of the ox, its texture strong; the foramen ovale obliterated (a point on which there is yet some discord among comparative anatomists). The aorta three inches diameter, its coats two lines and a half in thickness; the calibre of the pulmonary artery nearly the same; the thickness of its coat one line. Kidneys elliptic; lobes one hundred and fifty to one hundred and sixty. Stomach filled with a greenish dark fluid; its inner coat lined with ascarides an inch and a half long; they held on with great tenacity, rendering it difficult to detach them; the small intestines were inhabited thickly with teniæ, from one to five feet in length. Excrementa of the large intestines resembling thick verdegris paint. Penis about eighteen inches long, eight in circumference; the lobe about eight inches long, and three in circumference; the lower surface depressed for the reception of the urinary canal.

Species 2. Phoca Hispida? (P. Fœtida? *Pennant.*) *The Rough Seal.* This was caught in Jacob's Bight, on the 30th of June. It was four feet in length; hair on the belly of a silvery grey, with a few obscure dusky spots: back and sides dusky; on the latter, numerous [illegible] lines of a silvery hue gave it a map-like appearance; the hairs longer and softer than the P. Barbata. Head round; no external ears, apertures an inch behind the eyes; eyes large, irides hazel, pupil elliptic perpendicular, furnished with a nictitant membrane; eyebrows formed of four bristles, above the inner angles of the eyes. Upper lip thick, furnished with seven rows of whiskers; lip divided by a fissure, covered with a black naked skin. Nose small. Teeth in upper jaw, four front acute, the two outer ones longest; tusks solitary, long, acute; grinders five, tricuspidate: lower front, four acute; tusks solitary; grinders five, lobed. Fore-flipper with five fingers, the inner one longest; shorter in gradation, like the human foot: claws long, curved, acuminate. Hind flippers, also, armed with acuminate curved claws. The heart of this animal was examined, and in it the foramen ovale was found obliterated.

As our specimen is young, I am not certain that it is referable to the species quoted, and have therefore added a note of doubt.

Genus MUSTELA (*Weasel*).

Species, MUSTELA ERMINEA (*Ermine Weasel*). In lat. 73° 37′, and long. 77° 25′, on the West side of Baffin's Bay, a small animal of this species was shot; its length, from the tip of the nose to the insertion of the tail, eight inches and a half; to the tip of the tail eleven inches and a half. Head, back, and greater part of the tail, of a chesnut colour; the end of the tail black. The chin, cheeks, circle round the ears, and the toes, white; breast and belly of a yellowish white; the yellow prevailing most approximate to the chesnut.

This little animal, which has been compared with the common *Ermine Weasel* of Europe, agrees with it in every character. In the valley where it was shot, there were found hares, mice, and abundance of water birds, on the eggs of which these animals are known to feed.

Dr. Leach has received the same animal in its winter dress, from Hudson's Bay; it is whiter than British specimens.

Genus, URSUS (*Bear*).

URSUS ALBUS, *Brisson* (*White Bear*). On September 10th, the boats of the Alexander pursued and attacked two bears, which were swimming in the water; one we killed, but it sank; the other, also, was, after much trouble, killed and secured, and brought on board.

	Ft.	In.
Length from the snout to the tail......	7	8
Do. to shoulder-blade	2	10
Circumference of body, near the fore legs	6	0
Do. of neck......................	3	2
Breadth of fore paw	0	10
Do. of hind paw	0	8½
Circumference of hind leg	1	10
Do. of fore leg	1	8
Do. of snout, before the eyes	1	8
Length from the snout to the occiput...	1	6
Height at the fore shoulder, a little more than	4	0
Fore claws	0	2½
Hind ditto	0	1¾
Tail	0	4

Weight, after loss of blood...1,131½lbs.*

Teeth, front six, above and below; tusks one inch and a half long, in the upper jaw solitary, in the under jaw approximate to the fore teeth. Grinders four, above and below; the anterior one very small, the posterior very large, the intermediate ones approximating in size to the latter. The hair white, thick, and strong, very long on the body, and more so on the limbs. Nose black; eyes dark hazel.

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* It is supposed he must have lost thirty pounds of blood.

Genus, LEPUS (*Hare*).

Species LEPUS ARCTICUS, *Leach*. The only one of this species was shot in lat. 73° 37′, on the West side of the Straits. It was nearly the same size as *Lepus timidus* (the common Hare): the body was white, except that a few solitary black hairs, longer than the rest, were dispersed over every part, and which appeared to be rapidly coming away; the tips of the ears, and the short hair within the ears, were black; tail short and white.

It was shot on the first of September. Another shot by a Master of a Whaler, in May, at Hare Island, differed very little from the above. Dr. Leach thinks it to be very distinct from the common White Hare of Scotland, (LEPUS ALBUS, *Brisson*,) and equally so from the LEPUS VARIABILIS, *Pallas*. See Appendix, No. V.

Genus, BALÆNA (*Whale*).

Species, BALÆNA MYSTICETUS (*Northern Whale*). On the 31st of July, a whale was harpooned and brought on board by the boats of the two ships. It was what the whalers called a fair-sized fish; *i. e.* the longest of the whalebones, forming the fringe in his mouth, measured nine feet and a half.

The extreme length of this fish, from the tip of the lower lip to the furcation of the tail	46 ft.	0 in.
Girth of the animal, around the abdomen	28	0
Do. at the root of the tail	5	2
Length of tail from its root to the fork	4	0
Extent of ditto	15	7
Fins, length	9	0
Do. breadth	4	0
Do. thickness at the base	1	6

Spiracles two; longitudinal apertures placed nearly parallel to each other upon the top of the crown bone, about fourteen feet from the tip of the lip; they are about six inches long.

The eyes are placed on each side, about five feet from the top of the crown bone, about sixteen feet from the tip of the lip, and about one foot above, and rather behind, the angle of the mouth.

The fins are articulated about two feet obliquely behind and below the eyes.

The anus is placed about twelve feet before the extremity of the tail.

The penis about two feet before the anus; it is contained in a deep sulcus or groove, two feet long, the lips of which meet and conceal the organ. This is about nine feet long in its relaxed state, six inches in diameter at its base, gradually tapering to a point, in which the urethra terminates.

The under lip and the throat were white; a broad band of white extended across the abdomen, between the penis and the anus, which almost met on the back; the middle part of the lower surface of the tail white; on the edges of these white patches were many black blotches, giving the animal, on the whole, a pie-bald appearance.

The necessity of taking advantage of a fair wind, and clear water, obliged us to cast off the carcase, without making a further examination.

Class, AVES (*Birds*).

Genus, FALCO (*Falcon*).

Species, FALCO SMIRILLUS (*Merlin Falcon*). Several of these birds were shot in lat. 65°.

Genus, SOMATERIA, *Leach* (*Eider*).

Species 1. SOMATERIA SPECTABILIS (*King Eider*). A pair only of this species was shot, in about lat. 72°. Several were seen as high as 74°, mixing with Cuthbert's Eider. It is generally named *King Duck*.

The trachea of this bird resembles that of the Anus Moschata. *See Plate* 14. *fig*. 1. *and* 2. Latham.

Species 2. SOMATERIA MOLLISSIMA, (*Cuthbert's Eider*,) commonly named the *Eider Duck*.

Many of these were shot in the months of June and July, between lat. 71° and 74°.

Genus, CLANGULA, *Gesner* (*Garrot*).

Species, CLANGULA GLACIALIS (*Northern Garrot*). One only of this species was shot in lat. 72° N.

The vulgar name is *Long-tailed Duck*.

The most remarkable circumstance connected with this bird is the construction of its trachea.

The lower portion of the trachea, about an inch in length, is composed of six bony ribs on each side, which unite posteriorly, forming a convexity. Anteriorly they advance to complete the tube, but, terminating abruptly, they form on each side a ridge of small tuberosities, leaving an open space broader at the lower than at the upper end. The continuity of the wall of the canal is, however, finished by means of four delicate bony transversed bars, connecting the opposite ridges together, over which is spread a thin transparent membrane. The canal opens into an irregular bony ampulla, or labyrinth, from whose bottom the right bronchial tube emerges. From the fore and back parts of this ampulla are given off two processes of bone, which unite and form with its left side a kidney-form concavity, about the size of a horse-bean, over which is spread another membrane, resembling the membrana tympani of the ear, forming a membranaceous cell, from which originates the left bronchial tube. The communication between this last and the osseous one is scarcely perceptible.

The use of these complicated organs, more remarkable in the duck family than in any other, has yet to be demonstrated by the physiologist.

Genus, MERGULUS, *Ray* (*Seadove*).

Species, MERGULUS MELANOLEUCOS, (*common Seadove,*) popularly denominated *Little Awk*, or *Roach.*

The size of a small dove; breast and belly white, the rest of the bird black, except a white dot above the eyes. In this state of plumage they were found during the months of June, July, and August, the old bird, as well as the young in the nest.

At the end of September several were shot in lat. 66°, in all of which a change of plumage had taken place. The chin, throat, cheeks, had changed to white; the white feathers almost meeting upon the nape; the breast black and white mixed; the feathers of the scrag and interscapular regions intermixed also with some hoary feathers; the tips of the primary quill, coverts, and scapulars, white. In other respects the bird remained as in the summer months.

These birds were found in myriads, in July and August, in 75° and 76° latitude. On the west coast of Greenland many hundreds were shot daily, and supplied to the ship's company. They are extremely palatable; and, although feeding chiefly on a small species of cancer, with which the arctic seas abound, they were free from the taste of fish.

The Esquimaux of Prince Regent's Bay use their skins for their inward clothing.

Genus, PROCELLARIA (*Petrel*).

Species 1. PROCELLARIA GLACIALIS (*Fulmar Petrel*). This bird was found in great abundance in every part of the Straits and Baffin's Bay. There were two states. The most numerous (the adults) were of a hoary grey colour, with a white bar across the wing coverts when expanded. The others (the young) were of any uniformly dusky colour; in other respects they did not differ.

These birds live upon any oily substance they can find on the surface of the sea. Their stomachs are generally found loaded with a rancid oil, which they disgorge on being wounded. They collect in great numbers around the whalers, when they have caught fish, in order to pick up the refuse, which they devour with great gluttony. Their flesh is extremely offensive.

Genus, Grylle, *Leach*: Cephus, *Cuvier* (*Scraber*).

Species 1. Grylle. Scapularis, *Leach*, (*White-winged Scraber*,) common name, *Black Guilemot*.

The body entirely black, except a white spot on the wing, which is a distinguishing mark of the bird in all its ages. The bill is black, and the legs and feet crimson.

It is found in every part of Baffin's Bay, lays two eggs, about the size of a pullet's, of a dirty white, with black spots; makes its nest in the holes they find among the debris and the rocks on the shore.

A young one, shot in the beginning of August, measured twelve inches in length, and nineteen and a half in breadth; its plumage varied black and white. The white speculum on the wings distinct, although mixed with a few dark spots; its bill black, its legs and feet dusky.

Some others were killed in the month of November, in Shetland, in whom the plumage differed little from the last, but the legs and feet had assumed the perfect crimson colour.

Genus, URIA, *Brisson* (*Guilemot*).

Species 1. URIA FRANCSII, *Leach* (*Franks's Guilemot*). Larger than the last. Breast and belly white; rest of the bird black. Found chiefly in the southern part of the Straits. No variety was found in the plumage of any sort.

It differs materially from URIA TROILE, (*the Foolish Guilemot*) with which we, from the imperfection of descriptions, confounded it.—*See Appendix*, No. V.

Genus, COLYMBUS, *Latham*: MERGUS, *Brisson*: EUDYTES, *Illiger* (Diver).

Species 1. COLYMBUS SEPTENTRIONALIS (*Red-throated Diver*). One only of this species was seen; it was brought on board by some of the natives of Jacob's Bight. It was a young specimen.

Genus, LARUS (Gull).

Species 1. LARUS RISSA (*Kittiwake Gull*). This is a beautiful Gull, and is very num
in the Straits. In the full-aged bird

is of a beautiful lemon yellow; the orbits and inside of the mouth of a beautiful saffron red, indes straw colour, legs of a livid colour; the top of the head, the nape, back, wings, of a fine ash colour; tips of the wing-coverts black, the rest of the bird white.

In several young birds, shot in September, in lat. 70°, the bill and orbits were of a deep livid, in some the yellow was making its appearance. The plumage differed from the old ones, in the ash colour being deeper, and more general in the upper parts of the bird; many of the wing, wing-covert, and tail feathers, being tipped, otherwise marked with black; the lower parts, like the old birds, white. In this stage of plumage they are known as the *Tarrock Gull.*

Species 2. LARUS EBURNEUS (*Ivory Gull*). This bird is rather larger than the last. The bill of a deep lead colour, the edges and tips yellowish, two inches long from the angle of the mouth; the orbits of the eyes red, the irides brown; legs and feet black; tarsus one inch and three quarters; the whole plumage of an immaculate white. Length nineteen inches, breadth forty-one inches.

The young birds differed only from the above (which was a female) in being spottd black on different parts of the wing-coverts and spurious wings.

Species III. LARUS GLAUCUS (*Glaucous Gull*). Bill light horn colour, strong, gibbosity on the lower mandible, red; nostrils, linear, placed in the middle of the bill, no cere; length of bill from the base two and half inches; from the angle of the mouth, three inches; irides, straw colour.

Interscapulars, back, and wing-coverts, light ash colour; the rest of the plumage perfectly white.

Wings as long as the tail, the tail cuneiform; thighs, legs, and feet livid flesh colour; tarsus, two inches and three quarters; length, from twenty-six to twenty-eight inches; extent, from fifty-eight to sixty-four inches; there is no difference between the male and the female.

These birds were found from lat. 65° to 76°; more numerous to the northward.

On June 6th, in lat. 65° 35′, a gull was shot, its length was twenty-six inches; extent, fifty-nine inches; bill of a dirty flesh colour; the tip, dark horn colour; gibbosity, red; legs and feet livid flesh colour; plumage, white, but mottled on the back; wing-coverts, and breast, with indistinct shades of brown; toes, four, hind one clawed and strong.

June 9th, in lat. 66° 20′, killed another gull, whose character agreed in all respects with the last; except, that instead of being mottled, there was only a slight shade of ash on the wing-coverts, the rest of the plumage being white.

July 11th, in lat. 74°, two females were shot, differing from the former in being smaller, and in having yellow bills; the ash colour was also of a bluer hue, and was more general on the back and wings. These are the only two birds that answer to the Larus Glaucus of Linnæus and Pennant, the former are clearly a different species: No. 1. being the species in maturity; Nos. 2. and 3. verging towards complete plumage.

The habits of this last are also the habits of the Burgermeister of the Dutch; they build on high cliffs, and they destroy and eat the smaller aquatic birds. We did not, absolutely, see them attack other birds, but when our parties were out shooting the little awk, these gulls, hovering over our heads, would pounce upon the wounded birds, and carry them off. A female bird that was shot, disgorged a whole bird; and, being brought on board, it smelled so offensively, that it was immediately examined, and in its stomach was found another bird quite whole; the stomach was distended, and in a state of mortification as well as the small bird. The Gull, no doubt, had been unable to eject its prey, and the function of the stomach being suspended by the distension, irritation, inflammation, and, at length, putrefaction, had ensued.

Genus STERCORARIUS, *Brisson* (*Jager*).

Species I. STERCORARIUS CEPPHUS, (*Arctic Jager*,) common appellation, *Arctic Gull.* Bill, one inch and a quarter from the base, black; upper mandible, much curved at the point, with an odontoid procep; lower mandible, gibbous; nostrils linear, situated in a cere; tongue cleft; front, crown, and nape, dark brown; neck, cheeks, chin, throat, breast, and belly, white; about the vent varied with brown; all the rest of the body, dusky; wings, deeper coloured; the two middle feathers of the tail seven inches longer than the rest; legs, lead colour; thighs and feet, black; hind toe, clawed; length, twenty-one inches, including the two tail feathers; breadth, thirty-seven inches; irides, amber brown. This is the full-aged bird.

Some young ones shot, July 27th, differed, in the bill being lighter coloured; all the brown plumage of a lighter shade; the white plumage beneath less clear; the neck, all round, and the hind part of the abdomen, varied more or less with dusky feathers; the tail-coverts, barred white; wing and tail linings, mottled brown and white; shafts of the two outer primary quill feathers, white; the rest gradually browner; length from fourteen to fourteen inches and a half; breadth, thirty-six inches and a half to thirty-eight inches and a half; the two middle tail feathers in these three young ones, were from two to four inches only in length.

Genus Xema, *Leach.* (Xeme.)

This genus approaches to the Gull in the form of its beak, and to the Tern, in having a furcate tail, as well as in the general form and proportion of its legs; the only species hitherto discovered is the following:—

Species Xema Collaris (*Collared Xeme*). This bird was found only on a small island, in lat. 75° 20′, on the west coast of Greenland; it was found associating with the greater Tern, and when it saw its nest in danger, like them, uttering the same clamorous notes, flew, without fear, above its nest close to the head of the party. Its eggs were of the same size and form, and nearly of the same colour, as those of the Tern.

In my first edition, I was not aware that it had been discovered before, and therefore adopted the name *Larus Sabini*, which appeared in Thomson's Annals of Philosophy. I have since learnt that it has long been named *Larus collaris* in the Vienna Cabinet, by Professor Schreibers.

LARUS COLLARIS, *Schreibers.*—LARUS SABINI. *Sabine, Thom. Ann. of Philos.* Vol. xiii. Bill, one inch and a half from the angle of the mouth, an inch long from the base; upper mandible, a little curved at the point; the lower mandible, with the angular gibbosity peculiar to the Gull; the inner half of the bill black, the rest yellow; nostrils, linear, situated in the middle of the bill; tongue, long and cleft; inside of the mouth, and the naked orbits of the eyes, vermilion; irides, black; the nape, throat, and whole head, of a very deep cinereous, bounded by a black ring round the neck, two lines broad;

a small white spot under the eye; the neck, interscapular; region, and all underneath, white; back, wing-coverts, and scapulars, bright cinereous; spurious wings, black; the shafts, outer webs, and half of the inner webs of the first five primary quill-feathers, black; tips, white; the inner half of the inner webs, white to within an inch of their tips; the sixth feather white, with a little black in the middle; all the rest of the quill-feathers, white; tail white; outer feathers an inch longer than the middle ones; wings an inch longer than the tail; legs and feet, black; latter palmate four-toed; the hind one, clawed small; length, fourteen inches and a half; extent, thirty-four inches and a half; tarsus, one inch and a half; sex makes no difference in plumage; weight of male bird, seven ounces and a half; female six ounces and a half.

Genus STERNA (*Tern*).

Species 1. STERNA HIRUNDO (*common Tern*). This beautiful bird is found in every part of the Straits near the land, associating with the smaller Gulls, particularly the Kittywake; their eggs are about the size of a pigeon's, of a dirty green hue, with small dark blotches; the bill is beautifully subulate, crimson; in one or two, shot to the southward, the lip was black; front, crown, and nape, black; back, wings, wing-coverts, bright cinereous; outer web of first primary quill-feather, black; the outer web of the others, cinereous; the inner half of all the inner webs, cinereous; the outer half white to near their tips, which are black; tail-coverts, and the rest of the bird, white; in some, breast is tinged cinereous; tail, forked; the two outer feathers, longest; their outer webs, black; legs and feet, crimson; wings as long as the tail; length, sixteen inches; extent, twenty-five inches.

Genus CALIDRIS, *Cuvier* (Knot).

Species 1. CALIDRIS ISLANDICA (*Iceland Knot*), found about Hare Island, and Jacob's Bight, as high as lat 72°.

Genus CINCLUS, *Ray*, PELIDNA, *Cuvier* (*Dunlin*).

Species 1. CINCLUS ALPINUS (*Alpine Dunlin*).

Genus LOBIPES, *Cuvier* (*Lobefoot*).

Species 1. LOBIPES HYPERBOREAS, (*Red Lobefoot*,) commonly named *Red Phalorope* found as high as Jacob's Bight.

Genus LAGOPUS, *Ray* (*Ptarmigan*).

Species 1. LAGOPUS MUTUS? (*White Ptarmigan?*) A few only of this species were seen in the Waygat and in Jacob's Bight.

The male bird was perfectly white, with large scarlet naked eye-brows, which was inconspicuous in the female; the plumage of the latter was variegated white, black, and rusty-rufus; the legs and feet of both were thickly clothed with long soft white feathers down to the claws, giving them the exact resemblance of a hare's foot whence the name. It seems to be the White Partridge of Pennant. Edwards, *Ellis's Voyage*, page 37, &c.

Dr. Leach is strongly disposed to consider it as a distinct species, from the white or common Ptarmigan of Scotland. Should this conjecture be hereafter proved to be correct, he then proposes to name this species *Lagopus dispar*, from the difference existing between the two sexes, which is a physiological character of sufficient importance, if constant, to separate these birds as two species.

Genus EMBERIZA (*Bunting*).

EMBERIZA NIVALIS (*Snow Bunting*), found in every part of the Straits as high as 75°, lat.

DESCRIPTIONS

OF

THE NEW SPECIES OF ANIMALS,

DISCOVERED

BY HIS MAJESTY'S SHIP ISABELLA,

IN A VOYAGE TO THE ARCTIC REGIONS;

By Dr. W. E. Leach.

Type *VERTEBROSA.*

Class MAMMALIA.

Genus Canis, of *Authors* (Dog).

A variety approaching to the Wolf in many points of external character and in voice, was found in a domestic state amongst the inhabitants of Baffin's Bay. The great toe on the hinder feet is wanting. Dr. Blainville suppos it to be the origin of the Wolf-dog (the C Loup of the French).

Genus Lepus, of *Authors* (Hare).

Species *Glacialis*. Albus, vertice et dorso pilis nigricante-fuscis albo-fasciatis sparsis, collo lateribus nigricante alboque mixtis, auribus apice extremo nigris.

This animal, which will neither agree with the *Lepus albus* of Brisson, nor the *Lepus variabilis* of Pallas, both of which are now before me, is of the size of the common Hare, (*Lepus timidus*,) and of a white color. The back and top of the head are sprinkled with blackish-brown hair, which is banded with white; the sides of the neck are covered with hairs of the same colour interspersed with white. The extreme tips of the ears are tipped with black, intermixed with white; the insides of the ears have a few black hairs mingled with the white.

I am sorry that the skeleton, (which would, in all probability, have furnished a good specific distinction,) was not brought home.

Class AVES (Birds).

Genus Uria, of *Authors* (Guilemot).

Species *Franclii*. Rostro breviusculo crasso: mandibula superiore subarcuata apice abruptè acuminato.

Color albus: Dorsum perfusco-nigrum: Alæ pallidè nigricantes: Gula fuscesente-brunnea: Rostrum nigrum; mandibula inferior ad angulum inferiorem striga albida: Pedes nigri.

I first received this species from F. Franks, Esq. who took it off Ferroë, and named it after him, exhibiting a specimen of the bird, under the name *U. Francsii*, together with one of *Uria Troile*, and drawings of both species, to the Linnean Society in December. A notice of this bird, under the name of *U. Francsii*, is published in Thomson's Annals of Philosophy for January last; it has since been republished in the first edition of Captain Ross's voyage. It was sent home by all the ships employed in the northern expedition, under the name *Troile*, and it was even received as such, and believed to be no other, by the collectors of birds in this country. I was the first who perceived the distinction, and that too without comparison, and I instantly endeavoured to convince those who entertained doubts on the subject. Notwithstanding this, Captain Sabine who sent it home to his brother E. Sabine, Esq. as the *Troile*, and who first learnt from me that it was a distinct species, has, without any reference whatever to what I had told him, proposed to name it after an ornithologist, who was ignorant enough to describe it under the name of *Troile*, and to give the true *Troile*, (one of the most common and best known of the European birds,) under a new name!

Type *MOLLUSCA.*

Class PTEROPODA.

Genus, Clio, *Pallas.*

Species, *Borealis.*

This species occurred in great profusion in Baffin's Bay.

Genus, Limacina, *Cuvier.*

Species, *Arctica.*—Argonauta Arctica, *O. Fabricii.*

This likewise occurred in enormous quantities, but not one specimen reached England with its shell entire.

Class GASTEROPODA.

Genus Margarita, *Leach.*

Char. Testa anfractibus subinflatis; Spira tenuiter elevata: Apertura rotundata tenuis, internè imperfecta: Umbilicus perfectus profundus: Operculum rotundatum, nucleo centrali.

Species1. *Arctica*, purpurascente-carnea tenuiter striolata, operculo testaceo.

Baffin's Bay, Captain Ross, Captain Sabine.

Species 2. *Striata*, anfractibus longitudinaliter striatis et obliquè antiquatis.

Baffin's Bay, Mr. Beverly.

Genus NATICA, *Lamarck*.

Species 1. *Beverlii*, spira elevatiuscula, anfractibus superioribus convexiusculis.

Baffin's Bay, Mr. Beverly.

Species 2. *Fragilis*, spira ferè obsoleta, testa fragillissima, operculo hyalino.

Baffin's Bay, amongst the soundings taken up by Captain Ross's instrument.

Genus BUCCINUM, of *Authors*.

Species 1. *Boreale*, purpurascente-brunneum, anfractibus cancellato-striolatis, supra abbreviato costatis, lineis prominulis 1-canaliculatis spiraliter ascendentibus.

Baffin's Bay, on Hare Island, Mr. Beverly.

The canal of the anterior part of the shell, is of a moderate length.

Species 2. *Rossii*, anfractibus tribus basilaribus transversim costatis: tertio costis supernè imperfectis, anfractibus apicalibus simplicibus glabris.

Baffin's Bay, Mr. Beverly.

This species resembles at first sight *Buccinum Bamffium*, (murex Bamffius. *Donovan* [illegible] many readily be distinguished by the number of costated whirls, *Bamffium* always having the four basal ones ribbed. *

Class CONCHÆ.

Family I. Pholadidæ ?

Genus Pholeobia, *Leach.*

Char. Testa elongata, porticè clausa anticè hians: cardo edentulus: Ligamentum exterius prominens.

Species *Rugosa.* — Mytillus rugosus, *of English Authors.*

Family II. Myadæ ?

Genus Pandora, *Lamarck.*

Species *Glacialis,* anticè rotundata obtusa, dentibus cardinalibus crassissimis. Taken up with Soundings in Baffin's Bay. Received also from Spitsbergen.

In its general form it is allied to my *Pandora obtusa ;* (Solen Pinna, *Mont.*) a species not uncommon in the Sound of Plymouth, but it may be readily distinguished by the superior size of the teeth of the hinge.

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* Mr. Beverly communicated to me an *Achatina,* which he found on an island in Baffin's Bay, and as it is a tropical genus, I cannot refrain from noticing so extraordinary an occurrence.

Family III. VENERIDÆ.

Genus MACOMA, *Leach*.

CHAR. Testa compressiuscula æquivalvis, clausa, longior quam alta: Umbo postice vix prominens: Cartilago externa: valva dextra dentibus 2 fissis, sinistra dente 1 integro.

Species *Tenera*, concentricè elevato-striolata, epidermide viridescente-lutea. Lat. 76° N. Long. 76° W. Taken up with the soundings. Received also from the coast of Spitzbergen.

Genus CRASSINA, *Lamarck*.

Species 1. *Scotica*.—Venus, Scotica *Maton* and *Racket*. Lat. 62° N. Long. 62°. Taken up in 80 fathoms water. It differs in no respect from those taken on the southern coast of Devonshire, excepting in being rather smaller.

Species 2. *Semisulcata*, concentrice striolata ante medium usque ad umbones sulcata. The colour is much darker than in *C. Scotica*. A broken specimen only occurred in Baffin's Bay, but several in good condition were found amongst soundings on the coast of Spitzbergen.

Genus Nicania, *Leach.*

Char. Testa triangulato-orbicularis, æquivalvis, clausa: Umbo prominens: cartilago externa: Valva dextra dente uno valido bifido; sinistra dentibus duobus integris divaricatis.

Species 1. *Banksii*, glabruiscula polita, sub umbonibus impresso-excavato. Baffin's Bay, amongst soundings. Received also from the Spitzbergen coast.

Species 2. *Striata*, concentricè striata, sub umbonibus cordato-impressa. Lat. 76° 42′ N. Long. 76° W.

Family IV. Pinnidæ.

Genus Modiola, *Lamarck.*

Species 1. *Arctica*, alta, radiatim late striata. Baffin's Bay, on Hare Island, and among soundings.

Species 2. *Discrepans.* — Mytilus discrepans, *Montagu.*

A fragment of a large specimen differing in no degree from those of Scotland, occurred amongst the soundings from Baffin's Bay.

Genus MYTILUS (*of Authors*).
Species Pellucidus, *Pennant.*
Found on Hare Island, by Mr. Beverley.

Class BRACHIOPODA, *Cuvier.*

Genus, TEREBRATULA (of *Authors*).

Species, *Substriata,* testa radiatim et concentricè striolata.

Lat. 76° N. Long. 76° 55′ W. amongst soundings.

Type *ANNULOSA.*

Class CIRRIPEDES, *Cuvier.*

Genus BALANUS (of *Authors*).

Species *Arcticus,* testis costato-elevatis: costis irregularibus rudis, interstitiis lamellato-striatis. Baffin's Bay, on the rocks, common, Mr. Beverley. Unfortunately the operculum of this fine species was lost.

Class CRUSTACEA.

Genus, HIPPOLYTE, *Leach.*

Species. — Having mislaid the specimen, I cannot give a description of it.

Genus, Gammarus, *Latreille.*

Species 1. *Sabini*, segmentis dorsalibus posticè falcato-productis.

Baffin's Bay, Captain Sabine.

Class ANNELEIDES, *Cuvier.*

Genus, Nereis, *Linné.*

Species *Phyllophora*, ore edentulo, pedibus basi lamellis foliosis instructis. Baffin's Bay.

Genus Lepidonotus, *Leach.*

Species *Rossii*, pedibus densissimè testaceo-hirsutis, squamis dorsalibus cærulescente-griseis. Baffin's Bay, amongst soundings.

Dentalium, of *Authors.*

Species *Striatulum*, subcurvum longitudinaliter elevato-lineolatum.

Lat. 62°N. Long. 62°, amongst the soundings.

Type *RADIATA.*

Class ECHINODERMATA.

Genus, Gorgonocephalus, *Leach* (1815). Euryale, *Lamarck* (1816).

Species *Arcticus*, corpore supra glabro radia-

tim costato: costis tuberculatis, radiis longissimis, tenuibus, supra granulatis; articulis (apicalibus præsertim) distinctissimis.

Expansion two feet. Baffin's Bay. Captain J. Ross.

Type *AMORPHA.*

Class ACELEPHÆ.

The endless variety of this class received, were so contracted by the spirit, as to render it impossible for me even to guess at the genera to which they belong. Observations on these animals whilst living, accompanied by accurate drawings, are quite necessary to render the preserved specimens of any degree of use; and it is to be greatly regretted, that no naturalist, capable of performing these indispensable parts of his duties, accompanied the expedition.

APPENDIX, No. V.

CRIMSON-COLOURED SNOW,

AND

METEORIC IRON.

For the following information, respecting two of the most interesting subjects in natural history which were observed in the voyage of which the narrative has preceded, I am indebted to the kindness of Dr. Wollaston. Of the accuracy and the extent of his knowledge it does not become me to speak, as they have long acquired for him a reputation, to which even the praise of those who are accomplished judges of his acquirements can add nothing. I shall make no apology for giving in his own words, that which could in no other way be so well communicated.

" With respect to the exact origin of that
" substance which gives redness to the snow, I

" apprehend we may not be able to give a
" decided opinion, for want of a sufficient knowledge
" of the productions of those regions in
" which it was found; but, from all the circumstances
" of its appearance, and of the substances
" which accompany it, I am strongly inclined to
" think it to be of vegetable origin. The red
" matter itself consists of minute globules from
" $\frac{1}{1000}$, to $\frac{1}{3000}$ of an inch in diameter; I believe
" their coat to be colourless, and that the redness
" belongs wholly to the contents, which
" seem to be of an oily nature and not soluble
" in water, but soluble in rectified spirits of
" wine; when the globules are highly magnified,
" and seen with sufficient light, they appear internally
" subdivided into about 8 or 10 cells.
" They bear to be dried by the heat of boiling
" water, without loss of colour. By destructive
" distillation they yield a fœtid oil, accompanied
" with ammonia, which might lead to the supposition
" that they are of animal origin; but,
" since the seeds of various plants also yield this
" product, and since the leaves of Fuci also yield
" ammonia by distillation, I do not discover
" any thing in the globules themselves which
" shows distinctly from what source they were
" derived. I find, however, along with them, a
" small portion of a cellular substance, which

" not only has these globules adherent to its surface, but also contained in its interior; and " this substance, which I must therefore consider as of the same origin with them, appears " by its mode of burning to be decidedly vegetable, as I know of no animal substance which " so instantly burns away to a white ash, as " soon as it is heated to redness.

" The first conception I formed as to their nature was, that they might be the spawn of a " minute species of shrimp, which is known to " abound in those seas, and which might be " devoured by the myriads of water-fowl observed there, and voided with their dung; but, " in that case, they should undoubtedly be found " mixed with the exuviæ of those animals, which " is not the fact; but they are found accompanied solely by vegetable substances, in one of " which they are actually contained.

" If they are from the sea, there seems no " limit to the quantity, that may be carried to " land, by a continued and violent wind; no " limit to the period during which they may " have accumulated, since they would remain " from year to year, undiminished by the processes of thawing and evaporation, which " remove the snow with which they are mixed.

" I regret that the scantiness of our inform-

" ation does not enable us to come to any satis-" factory conclusion, and can only hope that " future navigators may have an opportunity of " collecting materials to elucidate so curious a " phenomenon." I must add to this account that the smell of the red matter in its present state is very offensive, resembling a mixture of fish-oil and drying-oil, or that coarse paint now in use for pallisades and other works out of doors.

Since the first edition of this work was published, the red substance which coloured the snow was determined by Mr. Francis Bauer to be vegetable, of the *Genus, Uredo.* This species which has now been discovered is named by me *Uredo nivales (Bauer)*, and is in the first instance colourless — gradually becoming red. Mr. Bauer is of opinion that it originates and generates in snow. The globules are in general $\frac{1}{1000}$, but they are found from $\frac{1}{3000}$ to $\frac{1}{800}$ part of an inch in size.

IRON, FOUND IN L. 76° 12′ N., L. 53° W.

" With respect to the iron, of which you " obligingly gave me a specimen, it appears to " differ in no respect from those masses of which

" so many have now been found on various parts
" of the surface of the earth; and which, in
" some few instances from tradition, and in all
" from the analysis, appear to be of meteoric
" origin. They all contain nickel, and this
" contains about the usual proportion of that
" metal, which I estimate between three and
" four per cent., as inferred from the quantity of
" crystallized sulphate of nickel which I obtained from it; but, though I can thus speak
" with decision as to the presence of a considerable quantity of nickel, I cannot undertake to
" pronounce with accuracy upon proportions
" deduced from so small a fragment as could
" be spared for this examination."

I have since obtained from Mr. Fyfe of Edinburgh, an analysis of which the following is a transcript:—

" The specimen of iron which you gave me
" for analysis, contains 2.56 per cent. of nickel.
" The method which I employed to ascertain
" this, was the following: 3 grains of the metal
" were dissolved in diluted nitric acid, a small
" quantity of blackish substance remained undissolved; aqua ammonia in excess was added
" to the solution, a precipitate of a brown colour
" fell; the solution was filtered; aqua potassa
" was then added in excess, and the solution

" boiled to drive off the ammonia, a precipitate
" of a greenish colour was gradually formed,
" which being washed and dried, weighed .1 of
" a grain. Considering the acid of nickel as
" stated by Thomson to be a compound of 100
" metal and 29.63 oxigen, this denotes 2.56
" per cent. of nickel in the specimen of iron.

(Signed) " A. Fyfe."

APPENDIX, No. VI.

LIST OF PLANTS,

BY

ROBERT BROWN, F.R.S.

For the following List of Plants, I am indebted to the kindness of Robert Brown, Esq., Librarian to Sir Joseph Banks, to whom the Admiralty very judiciously directed the specimens of Botany, collected by the different officers of the expedition, to be sent.

LIST OF PLANTS,

COLLECTED ON THE COASTS OF BAFFIN'S BAY,

From Lat. 70° 30′ *to* 76° 12′, *on the East Side;*

AND

AT POSSESSION BAY,

In Lat. 73°, *on the West Side.*

This List is formed from the Collections of the various Officers and other persons who were sent on shore, for the purpose of collecting specimens of Natural History.

TRIANDRIA.

Eriophorum polystachion, *Linn.*

Alopecurus alpinus, *Smith, Flor. Brit.* iii. p. 1386.

Agrostis algida, *Phipps's Voy.* p. 200. *Wahlenb. Lapp.* p. 25. t. i. Gramen sui generis.

Agrostis paradoxa, *nov. sp.* Vix hujus, forsan proprii generis.

Poa laxa, *Willden. Sp. Pl.* i. p. 386.

HEXANDRIA.

Rumex digynus, *L.* Distinctum genus (OXYRIA *Hill.*) efformat.

DECANDRIA.

Andromeda tetragona, *L.*

Pyrola rotundifolia, *L.?* Absque floribus haud determinanda.

Saxifraga oppositifolia, *L.*

——— propinqua, *nov. sp.* S. Hirculo, cui proxima, minor, et diversa præsertim calycibus nudis et petalis inappendiculatis.

——— flagellaris, *Sternberg Saxifr.* p. 25. t. 6. S. setigera, *Pursh. Amer.* i. p. 312.

——— tricuspidata, *Willden. Sp. Pl.* ii. p. 657.

——— cæspitosa, *L.* Notis nonnullis differt, forsan distincta.

——— petiolaris, *nov sp.* proxima S. rivulari.

——— cernua, *L.*

Silene acaulis, *L.*

Lychnis apetala, *L.*

——— triflora, *nov. sp.*

Cerastium alpinum, *L.*

ICOSANDRIA.

Potentilla pulchella, *nov. sp.* P. sericeæ affinis.

———— grœnlandica, *nov. sp.?* nimis affinis P. frigidæ et Braunianæ.

Dryas integrifolia. *Vahl in Flor. Dan.* 1216.

POLYANDRIA.

Papaver nudicaule, *L.*

Ranunculus ———, sulphureus forte vel glacialis; species e fragmentis non determinanda.

DIDYNAMIA.

Pedicularis hirsuta, *L.*

TETRADYNAMIA.

Draba muricella, *Wahlenb. Lapp.* p. 174. t. xi. f. 2.?

—— oblongata, *nov. sp.*

—— corymbosa, *nov. sp.?* præcedenti valde affinis et ambæ D. rupestri (*Hort. Kew.* iv. p. 91.) proximæ.

Cochlearia fenestrata, *nov. sp.* A. C. anglica et danica, quibus valde propinqua, differt valvulis subaveniis et dissepimenti elliptico-lanceolati axi dehiscente.

SYNGENESIA.

Leontodon Taraxacum, *L.?* varietas nana? vix species distincta.

MONŒCIA.

Carex compacta, *nov. sp.* C. pullæ affinis.

DIŒCIA.

Empetrum nigrum, *L.*

Salix arctica, *nov. sp.*

———— specimen mancum dubiæ speciei, præcedenti proximæ.

POLYGAMIA.

Hierochloe alpina, *Br.* Holcus alpinus, *Wahlenb. Lapp.* p. 51.

CRYPTOGAMIA.

Lycopodium Selago, *L.*

Polytrichum juniperinum, *Hooker and Taylor, Musc. Brit.* p. 25.

Orthotrichum cupulatum, *Musc. Brit.* p. 72.?

Trichostomum lanuginosum, *Musc. Brit.* p. 60.

Dicranum scoparium, *Musc. Brit.* p. 57.

Mnium turgidum, *Wahlenb. Lapp.* p. 351.

Bryum ————, absque capsulis.

Hypnum aduncum, *L.*

Jungermannia ———, fructificatione nulla.
Gyrophora hirsuta, *Achar. Syn.* p. 69.
——— erosa, *Achar. Syn.* p. 65.
Cetraria islandica, *Achar. Syn.* p. 229.
——— nivalis, *Achar. Syn.* p. 228.
Cenomyce rangiferina, *Achar. Syn.* p. 277.
——— fimbriata, *Achar. Syn.* p. 254.?
Dufurea? rugosa, *nov. sp.*
Cornicularia bicolor, *Achar. Syn.* p. 301.
Usnea? ———, *nov. sp.?* absque scutellis.
Ulva crispa. *Lightf. Scot.* 972.?

Algarum genus?? Confervis simplicissimis et Tremellæ cruentæ (*Eng. Bot.* 1800.) quodammodo affine?? Minute globules, the colouring matter of the Red Snow, of which extensive patches were seen in Lat. 76° 25′ N., and Long. 65° W.

APPENDIX, No. VII.

An ACCOUNT *of the* GOING *of the* CHRONOMETERS *which were embarked on board* H. M. S. ISABELLA *and* ALEXANDER, *during a Voyage of Discovery to the Arctic Regions*, 1818.

ON the 14th of April, 1818, seven chronometers were embarked on board H. M. S. Isabella, for the purpose of determining her longitude at sea, of which the following is an account: —

	No.	
Earnshaw's	815	Furnished by the Admiralty.
Arnold's	369	
Ditto	2151	
Earnshaw's	1024	The property of Captain Ross.
Arnold	25	The property of Henry Browne, Esq.
Ditto	523	Under charge of Captain Sabine.
Parkinson & Frodsham	228	Sent on board by the makers.

The five box chronometers were suspended by steel spiral springs from a fore and aft piece fixed to the beams in the cabin. This invention was intended to take off the effect of the shocks which the ship might receive among the ice. A piece of baize, in the form of a wrapper, long enough to reach the deck, was also attached to each of the springs, and being then tied round the box, and left loose to trail on the cabin floor, it counteracted the momentum occasioned by the ship's motion.

The rates of the two box chronometers belonging to the Admiralty, were obtained by Henry Browne, Esq., after a trial of two months, with his excellent clock; but Nos. 25. and 523. of Arnold, had not the advantage of being tried for so long a period. No. 1024 of Earnshaw, was in the hands of the maker three months, for the purpose of obtaining its rate.

No. 228. of Messrs. Parkinson and Frodsham, was sent by the maker to Mr. Browne's, about a fortnight before its embarkation, subject to the following remark: — "That it might be expected to accelerate from 4 to 10 on the first three or four months; but this propensity once disposed of, its rate would suffer no material alteration. No. 2151 had only been tried a few days, when it was unfortunately forgotten to be wound up; and as No. 523. was a pocket watch, it altered very much by the effect of heat and cold, and was therefore rejected by me in the calculations for the longitude; and No. 2151 having met with an additional accident in falling out of my hands, was also rejected for the voyage, and the watches were made use of for observing.

On the 14th of April, the corrections to mean time at Greenwich for the five box chronometers from which the longitude is laid down, were as follows: —

			″		″	
No.	815	fast	58.7	gaining	0.54	daily
—	369	—	7.51	—	7.35	—
—	228	—	0.45	—	3.	—
—	1024	—	0.59	—	1.	—
—	25	—	.51	—	2.	—

Nos. 2151. and 523. are left out, as they were not used in my calculations.

On the 1st of May, by observations taken at Gardie-house, on the Island of Brassa, in Shetland, its longitude was determined as follows:—

	°	′	″	
By No. 815	1	15	48	West.
— 369	1	09	50	—
— 228	1	33	34	—
— 1024	1	16	22	—
— 25	1	13	45	—
Means	1	15	52	West,

being only 22″ further west than my observations in 1814; and allowing Nos. 228. and 25. to balance each other, I take 1° 15′ to be the longtude of Gardie-house.

On the 13th of May, the longitude was determined by lunar observation, and was found to be—

	°	′	″	
Longitude, by means of five distances of the Sun and Moon, taken by Captain Ross.........,	21	08	30	W.
Longitude, by means of five box chronometers......................	21	8	15	W,
Diff.			15	

On the 14th May,

	°	′	″
Longitude, by means of three distances of the Sun and Moon, taken by Captain Ross	23	02	00
Longitude, by means of five box chronometers	23	01	22½
Diff.			37½

On the 27th May,

	°	′	″
Longitude, by means of five distances of the Sun and Moon	52	10	00
Longitude, by means of five chronometers	52	12	00
Diff.		1	00

On the 9th of June, the Isabella and Alexander being moored to an iceberg off North Bay Islands, on the east side of Davis' Strait, the outermost island bore W. by S. three miles distant, and the nearest S. by W. 1½ mile by compass. The latitude by observation was determined to be 68° 22′ 35″ North.

	°	′	″	
Longitude, by means of ten observations, taken by Captain Ross on the iceberg	53	47	53	W.

	°	′	″	
Longitude, by means of observations, taken by Lieut. Parry on the iceberg	53	42	00	W.
Longitude, by means of all the officers of both ships	53	45	11	

The longitude, by the means of the chronometers, did not materially differ from that obtained by so many lunar observations, taken under such favourable circumstances; but nevertheless, they were found considerably to differ from each other, and were accordingly regulated as follows:—

	°	′	″	
The longitude, by means of my observations, being	53	47	53	W.
And by the means of all the officers of both ships	53	45	11	W.
I take for my true longitude, the means	53	46	32	W.

	°	′	″	
At the same time, No. 1024 gave longitude	53	46	52	W.

I, therefore, consider that its rate has remained unchanged, and is therefore confirmed at + one second per day, gaining on Greenwich mean time, in like manner—

No.	Were found to be fast of Greenwich ′ ″		′ ″
815	— 1.39	gaining	— 1.0
369	—12.18		— 5.5
223	— 9.24		—12.5
25	— 1.10¼		— 4.

These rates commenced on the 1st of June, and on the 21st of that month, by lunar observations, no material alteration was found to have taken place; but, between that time and the 18th of September, no observations which could be depended on were obtained. Between the 18th and 24th of September, I had the following observations—

			′	″	
18	September,	☽ from Aldebaran, E. of her	7	00	W.
21	ditto	☽ from Pollux	5	30	W.
21	ditto	☽ ditto	6	00	W.
23	ditto	☽ from ⊙ E. means of 3 sets	4	55	E.
24	ditto	☽ from Aldebaran	4	15	E.

	′	″
The means of observations W. of the chronometer, being	6	10
And those E. of the chronometers being	4	35
The mean was found to be	0	47½

or slow of Greenwich time.

By these observations it must appear evident, that any error arising from the above difference, could not be perceptible on a chart, where the degrees of longitude amount only to fifteen miles; and therefore the situation of the land deduced from the ship's track must be correctly laid down; but although the means of the chronometers were so satisfactory, their differences from each other were so considerable that it was found necessary to give them the following new rates, *viz.*

			″	‴	
No.	815	Gaining	3	5	Daily
	369	—	2		—
	228	—	10		—
	1024	Losing	3		—
	25	Gaining	9		

On the 3d of November, the ships having returned to Brassa Sound, allowing 21½ seconds of time, or 5½ miles. The longitude was found to be as follows:—

	°	′	″	
No. 815	1	15	05	W.
369	0	46	20	W.
228	1	08	43	W.
1024	0	50	58	W.
25	1	20	46	W.
Means	1	08	52½	
	1	13	53	

Ditto, rejecting 369, which had gone irregularly for some days.

The lunar observations inserted in the foregoing abstracts, are only for the purpose of shewing how the chronometers were regulated. The true longitude both by the lunar observations and the chronometers will be found in the engraved tables, where the latitudes, variation, and magnetic dip are also to be found, as well as the meteorological observations. The latitudes and longitudes of the alphabetical list of places in Baffin's Bay and Davis' Strait, have been carefully taken from the chart which was constructed from the most approved observations made in both ships, by Mr. John Bushnan, and has since been deposited at the Hydrographer's Office in the Admiralty.

It ought to be mentioned, that during the voyage the ships never returned to the same place nor remained long enough in one situation for the usual method of regulating chronometers.

APPENDIX, No. VIII.

OBSERVATIONS

ON

THE DIP SECTOR.

The following Observations, taken by the Dip Sector, were furnished by Mr. J. C. Ross; but the use of this instrument was totally suspended in Baffin's Bay, by the inequality of the dip, and the refraction in the natural horizon, from which causes no result could be obtained by observing with it in the presence of ice. After leaving the ice, the weather was never again favourable for any observations with this valuable instrument.

May 13. Lat. 58° N. Long. 20° W. Light airs, and cloudy; temperature of the air 52¼; water at the surface 49°; barometer 29° 45′; hygrometer 2° 83′.

Points of the horizon observed, east and west clear, and well defined.

	INDEX UPPERMOST.				INDEX REVERSED.		
	°	′	″		°	′	″
	2	46	15		3	2	15
	2	46	15		3	2	18
	2	46	15		3	2	20
	2	45	40		3	2	20
Mean	2	46	06	Mean	3	2	18
	3	2	18				

4) 16 12

4 3 Dip observed.

4 11 Tabular Dip for 18 feet from Rio's Tables.

Diff. — 8

Points Obs. N.W. and S.E. In the N.W. the horizon was clear and well defined; in the S.E. the clouds descending beneath, made an occasional glare, but still well defined.

	INDEX UPPERMOST.				INDEX INVERTED.		
	°	′	″		°	′	″
	2	43	50		3	3	0
	2	43	50		3	2	50
	2	43	50		3	3	30
	2	43	50		3	2	50
Mean	2	43	50	Mean	3	3	2½
	3	3	2½				
4)		19	12½				
		4	48	Dip observed.			
		4	11	Tabular Dip.			
Diff.		+	37				

May 15. Lat. 57° N. Long. 25° W. 1^h 30^m P.M. Light airs N.N.W. cloudy weather; water at the surface 47½°; air 47°; barometer 29° 3′; hygrometer 3° 76′; sea smooth. Points observed N.E. and S.W. In the N.E. sky clear, horizon dark, and well defined. In the S.W. the clouds near the horizon dark, the horizon light, and not well defined.

	INDEX UPPERMOST.				INDEX REVERSED.		
	°	′	″		°	′	″
	2	44	55		3	2	30
	2	45	20		3	2	12
	2	44	10		3	1	30
	2	44	45		3	2	45
	2	44	10		3	1	30
	2	44	25		3	2	0
Mean	2	44	37½	Mean	3	2	4½
	3	2	4½				
4)		17	27				

4 21¾ Dip observed.
4 12½ Tabular Dip for 18¼ feet.

Diff. + 9¼

May 22. Lat. 57° N. Long. 42° W. At noon; wind N.W., a good breeze, day cloudy; water at the surface 38½°; air 39°; barometer 29° 77′; hygrometer 3° 78′. Points observed north and south, both of them clear and well defined.

INDEX UPPERMOST.	INDEX REVERSED.
° ′ ″	° ′ ″
2 45 35	3 2 37
2 45 43	3 2 44
2 45 30	3 2 40
2 45 36	3 2 40⅓
3 2 40⅓	
4) 17 4⅓	

4 16 1/12 Dip observed.
4 14 Tabular Dip 18½ feet.

Diff. + 2 1/12

May 31. Lat. 63° 53′ N. Long. 55° 03′ W. At 1 P. M. light winds, N. b. E. day cloudy; air 29°; water 32°; barometer 29° 62′; hygrometer 3° 95′; the horizons uncertain and changing; the sky and sea alike in colour; and the line of horizon, at times, scarcely perceptible.

N. and S. points observed by Mr. J. C. Ross.

	INDEX UPPERMOST.				INDEX REVERSED.		
	°	′	″		°	′	″
	2	44	05		3	2	30
	2	43	55		3	2	20
	2	44	0		3	2	10
	2	44	0		3	2	20
	2	2	20				
4)		18	20				
		4	35	Dip observed.			
		4	14	Dip for 18½ feet.			
Diff.		+	21				

June 2. Lat. 63° 41′ N. Long. 55° 42′ W. At 8h 30m P.M., light breezes from E.S.E.; sea very smooth; a great quantity of ice in sight; water at the surface 31°; air 33°; barometer 29° 48′; hygrometer 5° 90′.

INDEX UPPERMOST.	INDEX REVERSED.
° ′ ″	° ′ ″
2 45 53	3 3 50
2 46 5	3 3 58
2 45 58	3 3 54
2 45 59	
3 3 54	
4) 17 55	

4 28 75 Dip observed.
4 14 Dip for 18½ feet.

Diff. + 14 75

August 29. Moderate and cloudy. Points observed N.E. and S.W. by compass; the horizons not well defined.

By Mr. J. C. Ross only.

INDEX INVERTED.	INDEX UPPERMOST.
° ′ ″	° ′ ″
2 59 45	2 46 50
2 59 55	2 46 59
3 0 15	2 46 41
2 59 58	2 46 50
2 46 50	
4) 13 8	

3 17 Dip observed.
4 11 Dip for 18 feet.

Diff. — 54

On the 30th of August, lat. 74° 16′ N. long. 81° W.; a pleasant breeze from W.N.W. (true); horizon clear, and well defined; one or two icebergs in sight; water at the surface 36°; air 38°; barometer 29.72; hygrometer 8.10; 18 feet, height of the eye.

INDEX UPPERMOST.			INDEX INVERTED.		
°	′	″	°	′	″
2	48	30	3	2	35
2	47	50	3	2	18
2	48	35	3	3	25
2	47	50	3	1	45
2	47	32	3	2	35
2	48	20	3	2	20
2	48	10	3	2	40
2	48	45	3	2	30
2	48	11.5	3	2	31
			2	48	11.5
			4)	14	19.5

Dip observed	3	34.9
Dip for 18 feet	4	11
Difference	—	36.1

APPENDIX, No. IX.

AURORA BOREALIS.

The following observations were made by Lieutenant W. Robertson, whose attention was particularly directed to this phenomenon, which was not seen until late on our homeward passage. It is to be regretted that while they were visible, the ship was in a situation where the electrometer could not be used. The observations are, however, not uninteresting, as they tend to show that the place of the Aurora is often very near to the earth, and that it may appear in any direction as well as in the north.

H. M. S. Isabella, at Sea, lat. 66° 30′ N.
long. 59° W.

September 23. 1818, about ten in the evening, the Aurora Borealis was seen in the true south horizon; the horizon was first illuminated like the rising or setting of the moon behind a cloud, or rather like the illumination of the atmosphere caused by great fires; this extended four points of bearings; rays were soon after darted up perpendicularly in bundles to 20° altitude; the Aurora spread to S.E., without darting rays, and soon after disappeared; at midnight a very brilliant meteor darted from the zenith to the eastern horizon like a rocket, and was seen for 2″ or 3″; the evening was fine, with a light breeze from the westward, which shifted in the morning to the southward, blowing fresh with hazy weather.

September 26., in lat. 65° 50′ N. long. 61° W., about nine in the evening, the Aurora Borealis was seen very brilliant in every point of bearing, shooting bundles of rays of unequal length to the zenith. This Aurora was first seen through a thick mist in the zenith; as the mist passed away, the Aurora increased in brilliancy, the stars shone bright; not a cloud to be seen. At eleven the Aurora became less brilliant, and the sky again obscured with mist; the horizon continued hazy till two next morning, when the Aurora was again seen very brilliant in the zenith; weather again became foggy, the wind was light from northward, which shifted to S. by W.; moderate cloudy weather.

September 28. Lat. 65° N. long. 63°. At eleven P.M. observed the Aurora very brilliant, from S. by E. to S. by W. It first appeared from behind a cloud at the altitude of 5°, shining with a silvery light; shortly after darting up small bundles of rays to the altitude of 16°. There was no appearance of the Aurora in any other part of the heavens; weather calm and clear at its first appearance; a breeze soon sprung up from the west, which shifted to S. W. — Moderate weather.

September 29. Lat. 65° N. long. 63° W. At ten in the evening the Aurora was seen very brilliant from S. W. to S. E. (true bearings) shooting rays to the altitude of 15°; in the morning of the 30th, it was spread all over the heavens. Strong breezes from westward with clear weather; continuing to blow fresh from that quarter to past noon.

October 1. Lat. 62° 30′ N. long. 63° W. At eight in the evening the Aurora was seen in the true S.S.W. to S.S.E.; at nine, the luminous appearance spread from S.W. round by the S.E. quarter to N.E. in an arched form: the centre of the arch 18° high, the luminous part 3° broad; there was a very dark appearance under the arch, through which the stars appeared with the same glimmering light as through the luminous parts. Small bundles of sharp pointed rays were shot perpendicular from all parts of the arch to the altitude of 40°. About ten the arch shifted more to the westward, and soon disappeared, fresh breezes from W.S.W. true and clear starlight; at four A.M. 2d. light winds S.W. continuing all day with hazy weather.

October 6. Lat. 60° N. long. 56° W. Strong gales and squally, with snow and sleet; — observed the whole sky suddenly illuminated, for five or six minutes: this might be the Aurora in the zenith; wind N.N.W. moderating towards noon.

October 8. Lat. 59° N. long. 50° W. At eight in the evening, observed the Aurora very bright on the true east quarter, shooting beautiful rays in bundles from the horizon to the altitude of 60°; this was soon obscured by squalls of snow and sleet. From nine to twelve the Aurora was seen in every part of the heavens shooting streams of light in every direction, and most brilliant; appearing from N. by W. to W. by N. true bearings; strong winds and squally, with sleet, from N.W. by N. true, increasing to a hard gale on the ninth at noon, continuing to blow hard to noon of the tenth, when it moderated.

October 17. Lat. 51° N. long. 25° W. At eight P.M. observed the Aurora to begin in two concentric arches; the greatest arch, from true east to west, passing through the zenith, the smaller arch, south of the large one at an altitude of 45°, shooting fine rays from all parts, but most brilliant from the western. At half-past eight, these arches disappeared, and another most brilliant one was seen north of the zenith; the centre passing through the pole star, the extremities touching the eastern and western horizons, emitting fine rays, with all the prismatic colours. This arch was soon broken, and the Aurora flitted about in beautiful coruscations in the north-western part of the heavens, shifting round to the southward: the moon shone unclouded at the time, and the Aurora was sometimes seen passing her, eclipsing her in splendour. At 9^h 30^m the Aurora disappeared, the weather moderate at the time, with some light fleecy clouds in the sky, which had a dark appearance when passing under it. It blew hard from the westward in the morning, but moderated towards evening; wind shifted to the southward next day, with moderate weather.

APPENDIX, No. X.

REPORT

ON

COMPASSES, INSTRUMENTS, &c.

MADE TO THE ADMIRALTY.

Kater's Azimuth Compass,

WAS particularly useful in determining the variation when the ship was steady, or when azimuths could be taken on the ice or the land, as it can be read off with great accuracy; but it requires to be carefully levelled with a spirit level. It was also invaluable for obtaining the points of change and the amount of the deviation, and was always used for that purpose. Those on board the Isabella were both good, but the thread of one became out of order; the Alexander's were also equally good, and when carefully levelled, always agreed with the Isabella's.

Walker's Azimuth Compass,

Is certainly the best for azimuths when the ship has considerable motion; but its card being heavy, it ceased to traverse when the variation was 110°, and the dip 86°.

Insulated Steering Compass, supplied by Jennings.

This instrument answered the purpose for which it was intended, and completely obviated the effect of local attraction; but the card being heavy, and the needle short and not very powerfully magnetized, it ceased to act when the variation was great.

Alexander's (of Leith) Steering Compass,

Is decidedly superior to all others, the card and needle being well proportioned, and the friction being better counteracted by the ingenious manner of suspension. It is well adapted either for boats or ships, and if fitted as an azimuth compass cannot fail to excel, particularly when the ship has much motion: those we had on board the Isabella and Alexander traversed when all others had ceased to act.

Burt's Binnacle and Steering Compass.

This invention has several peculiar advantages. The facility with which it is lighted in stormy weather, [illegible] great advantage. The [illegible] of the [illegible] on board the [illegible] was [illegible] was therefore the [illegible] this [illegible] lighter [illegible] according to the [illegible] of the weather.

Crow's Steering Compass.

This compass was powerfully magnetic, and continued to traverse long after the Azimuths, but the card was also too heavy where the dip and variation were great. It is an excellent compass for other places where these effects are not so remarkable.

Crow's Boat Compass.

This compass answered extremely well, and appeared very good when the boat had much motion, but we had very little opportunity of trying it; it ceased to traverse before the steering compass.

Transit Instruments, and Clock Pendulum.

There was no opportunity of using these instruments after leaving Waygatt Island.

Repeating Circle.

No use was made of this instrument, as the time was always easily to be found with the sextant, in the usual way.

Mr. Browne's Dipping Needle.

This instrument, which was made by Nairne, was a great acquisition to us, being the only one which could be depended on. It was tried at Shetland, during our stay there when outward-bound, and also on our return, and was found to have continued without alteration.

Lockwood's Dipping Needle.

This is an ingenious instrument, and has every motion; but, owing to the impossibility of knowing when the card on which it stands is level, the results of our observations on it cannot be depended on. When the dip was above 80° it could not be kept in the meridian; and as it is made to read off only on one side, no correction can be made of whatever error it may have.

Jones's Dipping Needle.

This instrument was tried, but no result could be obtained from it, owing to a mistake which had been made in marking its error; this was not, however, discovered until the last time we had an opportunity of using it. At this time, however, the observations on it exactly agreed with those made on Mr. Browne's, and I have no doubt that it is a good instrument.

Troughton's Dipping Needle.

We never obtained any result from this instrument on which we could rely.

Troughton's Whirling Horizon.

This instrument could not be depended on, even in the smoothest water; for besides its vibrations, which produced an undefined image, the two reflected objects opened and closed above a diameter of the sun, in consequence of its inability to retain its horizontal position when the ship had motion.

Baine's Patent Log.

This instrument performed extremely well, but from a defect in the materials with which it was made, and which we were not able to replace, we could not use it after it was damaged. I am of opinion, however, that this instrument would be of great use, particularly to surveying vessels, as it is capable of measuring a distance with great accuracy.

Sir Humphrey Davy's Water-Bottle

Did not close so as to prevent the water from escaping or mixing with that nearer the surface as it came up.

Kater's Altitude Instrument.

This is likely to become a valuable instrument;—it requires practice, and Mr. Bisson and Mr. Ross made great progress in it; but it was not sufficiently near the truth to be depended on for working the time; the general opinion was, that it was on too small a scale.

Dip Sector.

This valuable instrument was used when on our passage out and home; but during the time we were in Baffin's Bay its use was suspended by the great inequality of refraction on the horizon.

Dip Micrometer.

This instrument was not used.

Electrical Apparatus.

This apparatus being intended to be used when the ship was frozen up, or stationary, did not come into use; there having been no opportunity fit for the purpose during the whole voyage.

Sympiesometer.

This instrument acts as a marine barometer; it has also the advantages of not being affected by the ship's motion, and of taking up very little room in the cabin. I am of opinion, that this instrument will supersede the marine barometer when it is better known.

The other instruments intended for this purpose require no reports.

Hydrometer

Was commonly used in obtaining the specific gravity of the water.

The Sector and Micrometer

Were used whenever it was possible, and the observations noted; but it was seldom that the horizon could be found sufficiently clear when among the ice; and afterwards, the ship had too much motion.

Baine's Log.

This machine, owing to some defect in the workmanship, soon wore out by the friction of the spiral wheel; it was afterwards repaired, but could not be shipped until our return to Shetland, when it was again set a going, and completely answered its purpose.

Jennings's Log and Glass.

These instruments were very superior, and if generally used would save expense.

Burt's Buoy and Knippers.

This invention appears to be very perfect, but owing to the water being generally above 150 fathoms, we had little opportunity of using it.

Lieutenant Cawley's Boat.

This boat is on an excellent plan, and had we been employed in surveying the coast, would have been useful in that respect, as well as in the principal one, that of saving our lives if driven to the boats. Although we fortunately never had occasion to use her, the reflection that such a resource was at hand, in instances where the ships were exposed to danger, could not fail to produce the best effects; and when it may become necessary to stow men and provisions for a considerable time in a small compass, this boat possesses many advantages.

Mr. Plenty's Cork Life-Boat.

This meritorious invention was in like manner of great service, for it evidently possessed the quality of sustaining the shock of striking on a rock or on ice without being in any way damaged; and, therefore, in case of shipwreck would have easily saved the lives of the crew.

JOHN ROSS, Captain.

APPENDIX, No. XI.

APPENDIX, No. XI.

TABLE of SOUNDINGS obtained in Davis' Strait and Baffin's Bay.

Date.	Latitude N.	Longitude W.	Depth of Water.	Nearest Land seen.	True Bearing	Distance in Miles.	Nature of the Soundings, and Remarks.
	° ′ ″	° ′ ″	Fathoms.				
June 5	65 35	54 16	45	Cocquin's Sound	E. by S.	36	Broken shells, (land high.)
4	65 42	54 50	70	Cocquin's Sound	E.	40	White coral and greenish mud.
"	65 41	54 15	50	Cocquin's Sound	E.	35	White coral and shells.
6	65 37	....	300	Queen Ann Cape	E. by N.	....	Mud (no land in sight.)
7	....	....	15	Disco Island	E.	9	Sand and shells, at midnight, (land rocky and high.)
8	....	....	60	Savage Islands	E.S.E.	72	No ground.
9	63 22 15	53 45	34	Outermost N. Bay Isles	S.	1½	Sand, (at an iceberg aground near islands.)
14	....	....	100	Whale Fish Island	E.	1½	No ground, (close to the S. entrance of the harbour.)
16	70 27 15	54 51	34	Waygatt Isle	S. W.	1	Stones, (at an iceberg aground.)
23	70 44	....	26 to 16	Four Island Point	20′ N.	2 to 1	Stones, (ship drifted from 26 to 15 fms.)
24	70 44	....	7	8′ East of Four Island Point	E.	8	Rocky, (ship was driven in 16 feet, 50 yards from the shore.)
26	70 45	54 22	27	Land North East Bay	S.	½	Rocky, (land in Jacob's or N. E. Bay on the S. side.)

29	70 50	54 25	160	In North East Bay	....	6	Mud, (midnight, near the middle.)
„	70 54	54 00	200	Ditto Ditto	....	4	No ground, (ship higher up the Bay.)
July 3	71 30	56 02	120	Black Hook	E.	10	No ground, (near land deep.)
„	71 33	56 40	70	Black Hook	E. by S.	28	Mud, (water deep near the shore.)
5	73 10	....	100	Opperniwick	E.	10	No ground, (water deep near the land.)
„	73 12	....	80	Ditto	E.	3	No ground, (ditto ditto.)
7	74 03	58 59	85	Three I. of Baffin	E.	45	Sand and gravel, (a bank 15 leagues from the land.)
9	74 03	57 33	180	Within Three I.	W.	2	Mud, (water deepest in the bay, inside of three isles.)
16	74 31	58 40	60	Three Isles	E. by S.	48	Sand, (bank.)
„	74 40	57 40	160	Ditto	E.S.E.	21	No ground, (inside of the bank.)
17	74 43	59 00	230	Devil's Thumb	E.	23	Mud, (inside of the bank.)
19	74 50	59 13	230	Horse's Head	E.N.E.	15	Mud, (inside the bank.)
21	74 50	59 40	220	Red Head	N.E. by E.	12	Mud and stones, granite and gneiss.
24	75 25	60 36	356	Ditto	E.N.E.	12	Mud, (water deepest near the land, and the mud softer.)
25	75 26	60 32	356	Sabine Isle	E. by N.	6	Mud, The ship drifted with the ice, and the water became shoaler as she increased the distance from the land.
„	75 27	60 39	270	Ditto	E.	10	Mud,
„	75 27	60 45	185	Ditto	E. ½ S.	12	Mud,

TABLE of SOUNDINGS obtained in Baffin's Bay—*continued.*

Date.	Latitude N.	Longitude W.	Depth of Water.	Nearest Land seen.	True Bearing.	Distance in Miles.	Nature of the Soundings, and Remarks.
	° ′ ″	° ′ ″	Fathoms.				
July 27	75 28	60 30	514	Melville's Monument	E.N.E.	9	Mud, (Melville Bay.)
31	75 53	61 22	380	Thom's Isle	E.	3½	Mud and one stone granite, (water deepest near the land.)
"	75 54	61 20	400	Ditto	E.	5	Mud and stone, (water deepest near the land.)
Aug. 2.	75 51 55	62 59 41	420	Cape Morris	N.E.	10	Soft mud, (at temp. 29½ when brought up.)
4	75 58 26	64 37 21	250	Cape Melville	N.E.	12	Soft mud and stones.
8	75 54 56	65 32 20	101	Ditto	E. by S.	15	Mud and small stones, (land high.)
10	75 54 58	65 22 21	100	Bushnan's Isle	E.N.E.	6	Mud and sand, (outside of Prince Regent's Bay.)
11	75 53 00	65 4 0	150	Ditto	E.S.E.	8	Gravel.
13	75 54 15	65 52 0	455	Pr. Regent's Bay	E. to N.	6	Very soft mud, (deep water in the Bay.)
16	75 56 48 to 75 54 24	66 24 to 67 12	40 to 57	Off Cape York	S.E.	4 to 5	Mud, stones, and shells, at each cast near and off the Cape, on a bank or reef.

17	75 54 to 76 12	67 15 to 69 55	35 to 70	Crimson Cliffs	S.E.	4	Stones and shells — Continuation of the reef, on which were many ice-bergs.
19	76 18	72 00	360	Cary's Islands	N.W. by N.		
„	76 28 28	73 19 42	350	Ditto	N.	………	Mud.
„	76 35	74 00	295	Ditto	N.E.		
„	76 54	74 21	192	Cape Saumarez	E.	30	Grey mud and chocolate clay and worms with sand, (this was the furthest north.)
20	76 46 16	75 21 42	240	Off Cape Clarence	N.	30	Mud.
21	76 32 46	76 54 48	110	Off Jones' Sound	N.W.	20	Stones and broken shells.
22	76 52 45	77 04 6	100	Ditto	N.N.W.	10	Stones and shells, (edge of a bank.)
23	76 36 51	77 04	98	Cape Lindsay	W.	8	Gravel, (edge of a bank.)
24	76 15 05 to 76 36 0	78 30	81 to 101 & 200	Off Cape Leopold	W.	9	Gravel, and above 10 fa. mud, (bank.)
25	76 10 0	78 30	57 to 95	………………	………………	12	Same bank, Sand, shells, gravel, coral, and above 100 fa. mud.
26	76 04 0	78 28	50 to 76	Off Cape Cockburn	W.	12	Ditto
27	75 40 0	77 08	65 to 100	Ditto	N.W.	14	Ditto
28	75 27 0	75 51	180 to 240 & 208	Cape Cunningham	W.	12	Mud and stones.
29	74 58 21	78 01 26	180 to 202 & 245	Ditto	N.N.W.	14	Mud and stones.

TABLE of SOUNDINGS obtained in Baffin's Bay—*continued.*

Date.	Latitude N.	Longitude W.	Depth of Water.	Nearest Land seen.	True Bearing.	Distance in Miles.	Nature of the Soundings, and Remarks.
	° ′ ″	° ′ ″	Fathoms.				
Aug. 30	74 19 30	78 43 58	210	Cape Charlotte	W.	16	Mud, (north of Lancaster Bay.)
31	74 08	80 0	674	Mouth of Lancaster Bay	W.	……	Mud, (temp. 29½ when taken up,) with rounded gravel of quartz rock.
,,	74 02	81 12	650	Lancaster Bay		……	Mud-worms, (depth uncertain, but not more.)
Sept. 1	73 39	77 08	1000	Possession Bay	S.	6	Soft mud, with some worms in it.
,,	73 35	77 10	450	Ditto	S. by E.	2	Gravel, stones, and two small living shrimps. The gravel consists of fragments of granite, gneiss, and quartz rock.
5	72 37 16	74 13 42	120	Cape M'Culloch	S.W.	17	Mud.
6	72 22 52	73 06 30	1050	Cape Coutts	S.W. by S.	21	Mud, coarse sand, and small stones, (temp. mud 28½.) The stones are fragments of grey secondary limestone.
7	72 16 42	71 46 30	1005	Cape Cargenholm	S. S.W.	24	Soft mud.
9	71 22 47	68 26	100	Cape Adair	W.	11	Sand.

9	71 10	68 20	90 to 51	Cape Eglinton	W	5	Sand.
			58 to 151			4	Sand and shells.
			158			12	Stones.
10	70 40	67 56	58 to 145	Off and on Agnes' Mon.	S. to W.	2 4 5	Fine sand and stones. The stones are granite, gneiss, and graywacke schist.
11	70 34 30	67 46 15	90 to 95	Bute Isle	S.W.	6	Olive-brown clay.
12	70 42	64 37	290	....	....	......	Rocky, no land in sight. — Centre of Davis' Strait.
14	70 19 20	65 30	570	....	....	....	Mud.
15	69 25	64 42	40 to 55	Cape Kater	W.	4	Sand, small stones, and broken shells — Isabella Bank.
			20 casts at 90				
			55 to 100				
16	69 05	64 48	26 to 55	Cape Bisson	W.	4	Sand and shells — Alexander's Bank.
17	68 07	65 00	180	Cape Broughton	S.W.	10	Mud.
18	67 27 6	61 09	1070	Cape Searle	S.W.	9	Reddish mud and grey limestone.
19	66 58 28	60 30	687	Dyer's Cape	S.W. by S.	15	Reddish mud.
20	66 44 09	59 20	400	No Land in sight	....	....	Mud.
21	66 56	56 18	48 to 56	Queen Ann's Cape	N.E.	....	Rocky.

TABLE of SOUNDINGS obtained in Baffin's Bay—*continued.*

Date.	Latitude N.	Longitude W.	Depth of Water.	Nearest Land seen.	True Bearing.	Distance in Miles.	Nature of the Soundings, and Remarks.
	° ′ ″	° ′ ″	Fathoms.				
Sept. 23	67 00	57 46 15	290	Mount Raleigh	W.	....	Mud.
26	65 54	54 55	370	....	....	......	Yellowish brown clay, with very fine sand.
28	65 05	60 42	156	....	....	....	Stones.
29	65 54	61 11	100	....	....	....	Rocky.
30	64 10	63 05	80	....	....	....	Stones.
2	....	....	650	Resolution	S.W.	18	Fragments, scarcely rounded, of gneiss, and hornblende schist; with calcareous brown clay containing serpulæ, corallines, shrimps, and fragments of shells.

APPENDIX, No. XII.

LATITUDES AND LONGITUDES OF PLACES.

	Latitude.		Longitude.	
	°	′	°	′
Adair, Cape - - -	71	24	70	00
Agnes Monument—Rock	70	37	67	30
Agnew, Cape - - -	71	24	71	45
Alexander, Cape - -	77	43	75	30
——— Bank - -	69	9	65	00
Allison Bay - - -	74	40	57	56
Antrobus, Cape - -	71	57	73	50
Arabella Rock - -	76	35	70	34
Ardrossan Bay - - -	70	37	68	40
Aston, Cape - - -	70	10	65	25
Athol, Cape - - -	76	23	69	41
Baffin's Islands - - -	74	01	57	25
Banks' Bay - - -	74	46	76	08
Barnard's Mountains -	75	55	31	00
Barrow's Bay - - -	73	40	83	45
Bathurst Bay - - -	73	33	76	24
Beatrice, Cape - - -	74	32	80	30

	Latitude.		Longitude.	
	°	′	°	′
Bell's Isle	71	27	72	00
Beverley Cliffs	75	40	67	30
Bisson, Cape	69	10	65	20
Black Hook, Cape	71	27	55	31
Booth's Sound	76	49	70	50
Borthwick	65	54	61	30
Bowen, Cape	72	25	74	40
Brodie Bay	68	00	64	5
Broughton, Cape	67	47	63	30
Browne's Islands	75	29	60	09
Bruce Bay	70	28	67	32
Bushnan's Isle	76	04	65	26
Bute Island	70	26	67	30
Byam Martin, Cape	73	33	77	10
Caledon, Cape	76	16	79	22
Campbell, Cape	64	06	65	12
Cargenholme, Cape	71	32	72	36
Carey's Islands	76	49	73	10
Catherine's Bay	73	30	81	50
Charlotte, Cape	74	32	79	30
Charles' Island	63	00	64	50
Chidley, Cape	68	37	53	33
Christian, Cape	70	35	67	37
Clarence, Cape	76	45	77	45
Clephane, Cape	65	54	61	0
Clyde, River	70	21	67	30

	Latitude.		Longitude.	
	°	′	°	′
Cobourg Bay	75	35	78	40
Cockburn, Cape	74	49	73	45
Coquin Sound	53	00	65	38
Coutts, Cape	72	00	74	10
——— Inlet	71	58	74	12
Cranstown, Cape	71	15	54	20
Crimson Cliffs, (Beverly)	76	00	68	00
Croker's Mountains	74	08	84	00
Cumberland Strait				
Cunningham, Cape	74	40	76	02
Dacres Cape	65	36	61	50
Dalrymple Rock	76	28	70	42
Darkhead, Cape	72	10	56	00
Desolation, Cape			49	15
Devil's Thumb	74	16	57	56
Disco, N. End	70	12	59	12
——— S. End	69	11	56	30
Duck Islands	68	49	53	42
Dudley Digges, Cape	76	05	68	54
Duneira Bay	75	27	53	30
Durham, Cape	65	59	61	54
Dyer's Cape	66	42	61	06
Edward's Bay	76	38	78	30
Eglinton, Cape	70	49	68	34
Elizabeth's Bay	73	30	80	00

	Latitude.		Longitude.	
	°	′	°	′
Enderby, Cape - - -	63	45	65	30
Exeter Bay - - -	66	30	61	00
Fanshawe, Cape - -	73	40	76	06
Four-Island Point - -	70	46	53	03
Frances, Cape - - -	76	28	79	25
Fry, Cape - - -	65	06	63	25
Gilbert Sound - -	67	42	53	20
Graham Moore, Cape -	72	54	75	28
Gamble Bay - - -	77	20	73	10
Hackluit Island - -				
Haig's Island - -	70	29	67	45
Hamilton's Bay - -	71	25	70	40
Hardwicke Cape - -	76	30	78	58
Hathorn, Cape - -	71	30	72	20
Hay, Cape - - -	73	35	80	35
Hope's Monument - -	72	46	80	45
Hewett, Cape - -	70	27	67	18
Hingston Bay - -	73	48	57	30
Hoare Bay - - -	65	18	63	30
Home Bay - - -	68	40	64	50
Hooper, Cape - -	68	06	64	36
Hoppner, Cape - -	76	56	70	48
Horse's Head - -	74	40	58	15
Horsburgh, Cape - -	74	35	73	45

	Latitude.		Longitude.	
	°	′	°	′
Hurd, Cape	77	49	78	48
Hynd's Bay	66	33	61	0
Inglis Bay	65	47	61	50
Inmallick	76	0	66	46
Iron Mountains	76	10	65	24
Isabella, Cape	77	48	77	00
Isabella's Bank	69	30	66	00
Jacob's Bay, (or N.E. Bay)	71	00	53	00
Jameson, Cape	71	45	73	30
Jones's Sound	76	20	78	10
Kater, Cape	69	39	66	15
Lady Ann Hope's Bay	75	54	80	00
Lancaster Sound	74	19	83	50
Lawson, Cape	71	45	55	36
Leifle Bay, (or Love Bay, or God Haaven	69	10	54	40
Leopold, Cape	75	40	18	12
Lewis, Cape	75	31	59	00
Lindsay, Cape	76	06	79	24
Loch Ryan	65	06	63	45
Mackintosh, Cape	67	.00	62	.00
Martin Mountains	73	25	80	00

	Latitude.		Longitude.	
	°	′	°	′
Mary Ann Island	71	25	71	35
M'Culloch, Cape	72	13	74	14
M'Douall, Cape	71	24	70	48
M'Leay, Cape	70	15	66	25
Meikleham, Cape	65	18	62	50
Melville, Bay				
Lat. 76° 5′ to 75° 12′; Long. 60° to 64°				
Melville, Cape	76	05	64°	30
Melville's Monument	75	33	59	18
Merchants' Bay	67	38	64	00
Miller's Island	65	12	63	18
Morris, Cape	76	09	62	08
Mouat, Cape	77	29	78	00
Murdoch, Cape	76	08	61	28
Nius, Cape	63	38	65	48
North Ayr	70	00	72	00
North Bay Islands	68	19	53	47
North Galloway	71	00	73	00
Operniwick	73	25	57	26
Osborne, Cape	74	24	81	42
Paget, Cape	70	10	75	55
Parry, Cape	77	06	71	23
Petowack	76	11	69	00
Possession Bay	73	33	77	28
Pond's Bay	72	38	75	00

	Latitude.		Longitude.	
	°	′	°	′
Prince Regent's Bay, Lat. 76° 10′ to 75° 45′; Long. 64° 60′ to			66	40
Prince William's Land	72	30	73	00
Prs. Charlotte's Monument	75	36	78	28
Queen Ann's Cape	66	24	53	20
Raleigh Mount	61	14	61	30
Red Head	74	55	53	44
Reid's Bay	66	48	61	40
Robertson, Cape	77	24	71	36
Raper, Cape	69	54	65	10
Rosamond, Cape	74	10	83	17
Sabine Islands	75	29	60	09
Salmon Islands	70	11	65	30
Savage Islands, (or Wild Islands)	67	44	53	40
Saumarez, Cape	77	30	73	52
Saunderson's Tower	64	50	63	44
Sowallick (or Iron) Mountains	76	10	65	04
Scott's Bay	71	10	70	00
Shackleton, Cape	73	36	57	15
Sheffield Bay	65	30	62	30
Siddon, Cape	75	17	59	00
Skene's Island	76	07	63	24
Smith's Sound	77	55	76	15

	Latitude.		Longitude.	
	°	′	°	′
South East Bay - -	69	00	50	00
Stair, Cape - - -	77	43	70	55
St. Clair, Cape - - -	64	15	64	55
Suffkowalfick - -	76	00	57	00
Sugar-Loaf Island - -	74	02	57	30
Thom Islands - -	75	40	60	00
Three Islands (of Baffin) -	74	01	57	25
Unknown Island - -	71	00	53	45
Walker, Cape - - -	75	46	59	54
Walsingham, Cape -	66	00	60	50
Walter Bathurst, Cape -	73	03	76	22
Warrender, Cape - -	74	19	82	30
Waygatt Island, (N.E. side)	70	24		
——— Strait (N. entrance)	70	26		
Whale Islands - - -	68	57	53	30
Whale Sound - - -	77	15	71	20
White, Cape - - -	76	35	70	36
Wilcox Point - - -	74	10	57	45
Wollaston Island - -	69	25	65	20
Wolstenhome Island - -	76	24	70	22
Wolstenhome Sound -	76	29	70	00
Women's Islands - -	72	45	56	40
York, Cape - - -	75	55	65	38

APPENDIX, No. XIII.

DEEP SEA CLAMMS,

INVENTED BY CAPTAIN J. ROSS, R N.

This instrument was invented by me on board His Majesty's ship Isabella, in the early part of our voyage to the Arctic Regions; many fruitless attempts had been made to procure substances from the bottom of the sea in deep water, by the instruments with which we were supplied; and I had an opportunity of observing the reasons of this failure, which led to the discovery of that which I am about to describe; and which, in almost every instance, completely succeeded in accomplishing that desirable object, of bringing up substances of any description, in considerable quantity, from any depth; but it has also been found to preserve the temperature of these substances, if they are soft, until it can be measured by the thermometer; and by these means the temperature of the earth can be nearly ascertained at any fathomable depth. In Melville Bay, on the 1st of August, it brought up, from four hundred and twenty fathoms, some soft mud, into which the thermometer was immediately immersed, and it gave 29½°; at the same time the self-registering thermometer, at the depth of two hundred and ten fathoms, gave the same temperature. In Prince Regent's Bay, in four hundred and fifty-five fathoms, it gave the same temperature. In the entrance of Lancaster Sound, at the depth of six hundred and seventy-four fathoms, the temperature of the mud was also found to be 29½°; and, at the highest part of that inlet in which we sounded, the mud was found to be, in six hundred and fifty fathoms, 29°.

On the 6th of September, in latitude 72° 23′ N. and longitude 73° 07½′ west, we sounded in one thousand and fifty fathoms, from which depth the instrument brought up six pounds of very soft mud; the next day being quite calm, we tried the temperature of the sea at five, six, seven, eight hundred, and a thousand fathoms; and found its temperature decreased from thirty-five gradually to the same temperature as the instrument gave it, which was twenty-eight three-quarters; although the instrument may not bring up the mud at the exact temperature of that at the bottom, it may be supposed that it cannot have suffered much alteration from its agreeing so nearly with the self-registering thermometer, and that, if it has altered, it must be to increase the degree of temperature; hence it may always be inferred, that the mud at the bottom is not of a higher temperature than that brought up by the instrument. The reasons for so little alteration taking place, is the closeness with which the instrument confines the mud, which is such as not to allow even the water to escape. If the instrument strikes among stones, which are small enough to get between the forceps, it will bring up as many as are enclosed in them; in one instance it brought up a stone which weighed two pounds and a half, from three hundred fathoms; and in another, it struck a rock and cut a piece out, which it brought up from two hundred and sixteen fathoms. The instrument was made from the model by the ship's armourer, and succeeded on the first trial.

To use the deep sea clamms, it is necessary to be provided with whale lines, such as are by the Greenland and South Sea ships, whi two and a half inches in circumference, m the best hemp, and very pliable and easily the lines ought to be spliced together, and faked or coiled so as to run quite clear on the fore part of the ship's decks. In very deep water, it is necessary that it should be calm or nearly so, to be certain that soundings are obtained in 500 fathoms; but, in a light breeze, the instrument may be hung to a boat and towed in the direction of the ship's drift, and if there is any wind it is best to lower all the sails down. An outrigger, fitted with a block, should be fixed on the weather-quarter, through which the line ought to be rove and bent to the instrument, when it ought to be lowered until it is a fathom below the surface, and then let go; the instruments and lines may, however, be made for different depths, and used accordingly; for the North Sea, I would recommend one of fifty pounds. The following are the dimensions and description of the first that was made:—

DESCRIPTION *of a* MACHINE *for taking up Soundings from the Bottom of any Fathomable Depth; invented by Captain* JOHN ROSS, *His Majesty's Ship* ISABELLA, *and called by him,* A DEEP SEA CLAMM.

A B. A hollow parallelogram of cast iron (1 cwt.), eighteen inches long, six by six, and

HYDRAPHORUS,

INVENTED BY CAPTAIN J. ROSS.

It was one among other instructions to procure water from various depths during the voyage, with a view of ascertaining its specific gravity. An instrument for this purpose was recommended and sent out by Sir H. Davy, but as its power was limited to 80 fathoms, it did not fulfil all the requisite conditions. I accordingly invented another instrument, of which the following is a description; I may add that it has been approved by the Lords Commissioners of the Admiralty, who, with their usual liberality, ordered the instrument to be made and sent out with the present expedition.

This Instrument consists of a copper vessel, the body of which is cylindrical. The upper part, where the machinery is fixed, is square, having on one side a small aperture to admit water. This is covered by a circular plate in which another aperture is made to coincide with the former, when placed opposite the fleur-de-lis; a cover is fitted to protect this plate, the edge of which being divided into 800 equal parts, the aperture on the outside can be set to the required position. On the opposite side of the instrument there is a similar plate or wheel, which moves the former; and both are turned by the rotator as the Instrument descends, by the action of the water, the former in a proportion as one is to one hundred. The vanes of the rotator are made to fix in any position, which by actual experiment may be found to be applicable to a graduated wheel; and it is evident, that by placing them in a more vertical or horizontal position, a greater or lesser depth may be obtained during a revolution of the graduated plate; but when it has been once regulated, to agree in a convenient proportion, to these divisions, it will not be necessary to alter the vanes, as the aperture may be easily set to the exact depth from which the water is required. At the top of the instrument there is a spring valve, for the double purpose of allowing the air to escape when the water enters, and to let the air enter when the water is drawn off by the stop-cock at the bottom, and in the latter case the valve must be moved up by hand.

In using this Instrument—

It must be carefully emptied, the stop-cock turned, and the aperture on the graduated plate set by means of the rotator, at the proper distance from the fleur-de-lis, on the top of the instrument. An out-rigger and leading-block should be fixed on the ship's weather-quarter, and the whale-line being rove and bent, the end ought to be *stopped up* to prevent its getting entangled with the rotator. If water is required from a considerable depth, weight must be added by making fast a lead to the ears for that purpose on the sides of the cylinder; it ought to be carefully tended by a person outside of the ship, in getting it out or in board, as the vanes of the rotator may be easily damaged by striking against the ship's side; but as this accident will sometimes unavoidably happen, spare vanes are sent to replace those which may be broken. The Instrument must be allowed to descend a few fathoms below the depth it is set to, in order to ensure the aperture being passed the fleur-de-lis, and by the proportion between the length of the line veered and the number of degrees marked on the graduated circle which have passed that point, the exact depth at which the water came into the Instrument may be easily found.

Instruments of this kind may be made of any size, but that intended for the expedition was

18 inches in length besides the swivel, the circumference of the cylinder 15½ inches, the whole weighing 78½ pounds, and intended to contain about 3 English pints of water.

DESCRIPTION. FIG. 2.

F — Section of the machinery.
G — Upper part or rope of the instrument.
E — The instrument complete.
No. 5 — Vanes of the rotator.
6 — Rotator with spiral wheel.
7 — First large wheel turned by the rotator.
8 — Small wheel on the same axis, a. No. 7.
9 — Second large wheel turned by No. 8.
10 — Swivel to which the rope is attached.
11 — Spring air valve.
12 — Aperture in the wheel coinciding with one in the cylinder to admit water.
13 — The ears for attaching additional weights.
14 — Stop cock.
15 — Rope.

FIG. 3d.

DESCRIPTION OF A

MARINE ARTIFICIAL HORIZON

INVENTED BY CAPTAIN J. ROSS, R. N.

THIS instrument consists of a box similar to that of a mariner's compass, suspended in the same manner. The top of this is partly covered with a plate of dark glass, by the sides of which spirit levels are attached at right angles, and in such a manner, that the reflected images of the sun and the bubbles of each level may be easily seen within the field of a tube or telescope; at the bottom of the box, a weight is fixed with adjusting screws, by which the instrument can be levelled nearly to the top of the box: four wires are fixed, and on each wire a moveable ball. The four balls being one-half the weight of the plummet below, and double its distance from the point of suspension, it is calculated that they may be adjusted so as to counteract nearly the momentum of the plummet below; and to counteract the vibration attendant on the motion produced by the roll of a ship, a line is fastened to the plummet, this being loaded with lead and cork, and immersed in a vessel of water; but a wrapper of woollen cloth will answer the same purpose, and is more convenient; as it is then unnecessary to employ the vessel of water. When the instrument is nearly levelled, the bubbles will be seen to pass slowly from one end to the other of the spirit level; and when the limbs of the reflected images of the sun are observed to be in contact, when the bubbles are on the centre in passing each way, the altitude must be correct.

DESCRIPTION. FIG. 3.

H. Represents the face or top of the Instrument.
20. The Spirit Levels.
21. The Plate of dark Glass.
23. The wooden Case containing the Instrument.
N. B. A glass Cover is necesssary, if there is much wind.
K. Represents the perspective view of the Instrument, the sides of the Case being off.
18. The four moveable Balls for adjusting the Momentum.
19. The Gimbols.

16. The Box.
17. The Plummet with adjusting Screws.
20. The Spirit Levels.
21. The dark Glass.
22. The Vessel, containing water, in which the loaded Line is immersed.
23. The wooden Case.

This Instrument has been tried, but not found sufficiently correct for finding apparent time; and it requires great care and practice even for a latitude, and the inverting telescope cannot be used with it.

THE END.

Printed by Strahan and Spottiswoode,
Printers-Street, London.

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